HCJournal™
Home Computing Journal

Volume 3

HCJ FEATURES

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HCJournal™
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Welcome to: Volume 3

—Intelligent Software for Personal Computers in a Home Environment

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Notice For Atari Users:
This Volume's Feature programs rely so heavily on string arrays that we found it impractical to convert them into Atari BASIC, which does not support string arrays. So, instead of *IS-Base*, *Crossword Composer*, and *Perfect Puppy*, we designed a special Atari section. This section answers the many letters we've received requesting Atari versions of certain programs published in HCM prior to commencement of Atari coverage. We therefore present to you three of HCM's most popular number-crunching software tools: *It Figures!*, *Savings Planner*, and *Matrix Muncher*.

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Home Computing Journal (HCJ) is a quarterly multi-media software subscription service containing ready-to-run productivity, education, entertainment, and utility programs on a floppy disk. The accompanying workbook contains the required support documentation plus additional technical notes and programming aids. For current single-copy and subscription pricing, please see last page. HCJ assumes no liability for errors in articles, programs, or workbook material.

IS-Base

What is IS-Base? Information power—without the price.

Most database programs tend to be somewhat confusing and intimidating. Just setting up a file with the correct number and types of fields can take considerable time and pre-planning. Because *IS-Base* does not contain "fields," so to speak, it does *not* require the usual pre-organization of data files. In fact, there is very *little* that *IS-Base* has in common with other database programs at all! What then, *is IS-Base*? In a nutshell, *IS-Base* is an efficient, ridiculously-easy-to-use data storage/retrieval program that can process virtually everthing that you throw at it . . . That's *not* a small task for an information tool of this simplicity—a program that basically has only three active commands or "verbs."

How To Converse With The Program

When you run *IS-Base*, you are presented with a question mark and a blinking cursor. The question mark is your prompt, and the cursor blinks in anticipation of a command. *IS-Base* is designed around the English sentence. To converse with the program, simply enter a command and press [RETURN] or [ENTER]. If you enter a command incorrectly, a message is displayed and you are presented once again with the familiar question mark. When entering commands, you have several line editing capabilities. Refer to your computer's control capsule for the various editing features available.

The Data Disk

Before running *IS-Base*, you must have an initialized disk (a data disk) to store the information you enter. We recommend that you use a blank disk for maximum storage space. Before entering any *IS-Base* commands, your data disk should be placed into your computer's disk drive.

Different data disks can be used for different database files. Just think of each data disk as a separate file cabinet of information. To open a file cabinet, simply insert that disk into the disk drive. This can be done at any time during execution of the *IS-Base* program (except, of course, during disk access).

All entered data is stored entirely on the data disk. Because of this, you can exit the program at anytime without losing any data. Chances are, your data would survive even a power outage! During the course of the program's operation, the computer creates certain files on your data disk. The names of these files are explained in your computer's Spec Sheet elsewhere in this article. You do not have to understand, or even know about these files to operate the program. Just as long as you don't reinitailize your data disk, your data is safe.

All You Need To Know

There are really only three commands that you must learn in order to use *IS-Base*. These commands are **IS**, **FIND**, and **FORGET**. Briefly, the **IS** command allows you to enter information into the database, **FIND** allows you to search the database, and **FORGET** allows you to delete information from the database. Once you understand these three commands, you can start putting *IS-Base* to work. The following provides explanations of these commands:

Command: **IS**
Example:

```
?JOHN PARKER IS A BUSINESS ASSOCIATE
?JOHN PARKER'S ADDRESS IS 675 ALDER, SPRINGFIELD, MN 40735
?JOHN PARKER'S PHONE NUMBER IS (301) 285-2844
```

Explanation:

Here we have entered three pieces of information into the database. We have entered John Parker's address, phone number, and his relation. Now, you can see how our program achieved its name: All information is entered into the data base with a simple declarative sentence using the "IS" conjugation of the verb *to be*. So, to add anything to your database, just enter it using this simple sentence format.

Command: **FIND**
Example:

```
?FIND JOHN PARKER'S ADDRESS
Found:
JOHN PARKER'S ADDRESS IS 675 ALDER, SPRINGFIELD, MN 40735
```

Explanation:

In this example, we asked the computer to find John Parker's address. The computer responded with the statement "Found:" followed by the desired information. Use the command **FIND** * to list all the data in your database. (To understand why this works, see the section on wild cards later in this documentation.) Even though the **FIND** command is simple to use, it can contain many powerful search parameters. These parameters are also detailed later.

Command: **FORGET**
Example:

```
?FORGET JOHN PARKER'S PHONE NUMBER
Found:
JOHN PARKER'S PHONE NUMBER IS (301) 285-2844
Should I forget this? Yes
JOHN PARKER'S PHONE NUMBER IS (301) 285-2844
--> Has been forgotten
```

Explanation:

Here we have deleted John's phone number from our database. Before the computer erased the phone number, the computer asked if it was O.K. to do so. We answered yes, and so that piece of information was forgotten. In searching for the information to be forgotten, the **FORGET** command accepts the identical search parameters as the **FIND** command. See the following section for a description of the various search parameters available.

Search Parameters

Search parameters are what you use to specify information that you are searching for. You use search parameters to find information that will be viewed, forgotten, or edited. The *IS-Base* commands **FIND**, **FORGET**, and **EDIT** all use search parameters. We will use the **FIND** command for explanatory purposes, but the following examples are equally relevant for the **FORGET** and **EDIT** commands. While reading over these examples, assume that the following information has been entered into the database:

```
?JOHN PARKER IS A BUSINESS ASSOCIATE
?JOHN PARKER'S ADDRESS IS 675 ALDER, SPRINGFIELD, MN 40735
?JOHN PARKER'S PHONE NUMBER IS (301) 285-2844
?CRAIG HENDERSON IS A BUSINESS ASSOCIATE
?CRAIG HENDERSON'S ADDRESS IS UNKNOWN
?CRAIG HENDERSON'S PHONE NUMBER IS UNLISTED
?A MYSTERIOUS FELLOW IS CRAIG HENDERSON
```

Now we'll describe the 5 basic search parameter formats. The <...> symbol represents the search parameters entered by you. All commands and keywords are in bold.

Format 1: **FIND** <...> **IS** <...>
Example:

```
?FIND JOHN PARKER'S PHONE NUMBER IS (301) 285-2844
Found:
JOHN PARKER'S PHONE NUMBER IS (301) 285-2844
```

Explanation:

This is the most basic and explicit search format. Here, you specify letter for letter the piece of information that you are looking for. You use this search format when you are looking for one specific piece of information.

Format 2: **FIND** <...>
Example:

```
?FIND JOHN PARKER'S ADDRESS
Found:
JOHN PARKER'S ADDRESS IS 675 ALDER, SPRINGFIELD, MN 40735
```

Explanation:

In this format, search parameters are provided for only the left side of the **IS** command. Any piece of information entered as "JOHN PARKER'S ADDRESS IS <...>" will be found. It does *not* matter what was entered after the **IS** command.

Format 3: **FIND WHO IS** <...> or **FIND WHAT IS** <...>
Example:

```
?FIND WHO IS A BUSINESS ASSOCIATE
Found:
JOHN PARKER IS A BUSINESS ASSOCIATE
CRAIG HENDERSON IS A BUSINESS ASSOCIATE
```

Explanation:

In this format, search parameters are provided for only the right side of the **IS** command. Any piece of information entered as "<...> IS A BUSINESS ASSOCIATE" will be found. It does *not* matter what was entered before the **IS** command. The keywords **WHO** and **WHAT** are interchangable.

IS-Base Spec Sheet: Apple II

Control Capsule

Key	Function
Cursor left	Move left
Cursor right	Move right
Delete	Delete a character
CTRL I	Insert a space
CTRL E	Erase current entry
Return	Accept entry
CTRL S	Freeze screen/printer output
ESC	Escape current operation

Disk Specs

When you first boot *IS-Base*, the location of your data disk defaults to slot 6, drive 1. You can change this from drive 1 to drive 2 with the **DRIVE** command. Entering the command **DRIVE 2**, directs *IS-Base* to use drive 2 as its default drive. To change the default back to drive 1, simply enter the command **DRIVE 1**.

The following is a list of the files that are created on your data disk by *IS-Base*.

Filename	Function
ISBASE.DAT	Holds all entered data
ISBASE.KEY	Holds the function key definitions
ISBASE.TMP	A temporary data file

Note: If using an Apple IIc, IIe, or IIgs do *not* run *IS-Base* with with 80-column mode activated—strange things may occur when accessing the printer.

Function Keys

Because the Apple computer has no designated function keys, we had to ad lib. Function keys 1 through 10 are achieved by holding down the [OPEN APPLE] key in conjunction with a number key 1 through 0. So, function key 1 is [OPEN APPLE] 1 while function key 10 is [OPEN APPLE] 0. Only function keys 1 through 9 are re-definable with the **KEY** command. Function key 10 always produces that last command that you entered. The default function key definitions are as follows:

Function Key	Definition
[OPEN APPLE] 1	FIND
[OPEN APPLE] 2	FIND *
[OPEN APPLE] 3	FORGET
[OPEN APPLE] 4	EDIT
[OPEN APPLE] 5	PRINTER
[OPEN APPLE] 6	SORT
[OPEN APPLE] 7	CRUNCH
[OPEN APPLE] 8	CLS
[OPEN APPLE] 9	BYE

Note: Because the OPEN APPLE key is only available on Apple IIe, Apple IIc, and Apple IIgs, other models cannot use the function key option.

Format 4: **FIND ALL** <...>
Example:

```
?FIND ALL CRAIG HENDERSON
Found:
CRAIG HENDERSON IS A BUSINESS ASSOCIATE
A MYSTERIOUS FELLOW IS CRAIG HENDERSON
```

Explanation:

In this format, search parameters are provided for either the left or right side of the **IS** command. Any piece of information entered as "CRAIG HENDERSON IS <...>" or "<...> IS CRAIG HENDERSON" will be found.

Format 5: **FIND ALL RELATED TO** <...>
Example:

```
?FIND ALL RELATED TO A BUSINESS ASSOCIATE
Found:
JOHN PARKER IS A BUSINESS ASSOCIATE
JOHN PARKER'S ADDRESS IS 675 ALDER, SPRINGFIELD, MN 40735
JOHN PARKER'S PHONE NUMBER IS (301) 285-2844
CRAIG HENDERSON IS A BUSINESS ASSOCIATE
CRAIG HENDERSON'S ADDRESS IS UNKNOWN
CRAIG HENDERSON'S PHONE NUMBER IS UNLISTED
A MYSTERIOUS FELLOW IS CRAIG HENDERSON
```

IS-Base Spec Sheet: C-64

Control Capsule

Key	Function
Cursor left	Move left
Cursor right	Move right
DEL	Delete a character
INST	Insert a space
HOME	Move cursor to beginning of line
CLR	Erase current entry
RETURN	Accept entry
Commodore key	Freeze screen/printer output (keep held down)
Left-arrow	Escape current operation

Function Keys

The **KEY** command is used to re-define the Commodore function keys located on the right of the keyboard. Only function keys 1 through 7 are re-definable with the **KEY** command. Function key 8 always produces that last command that you entered. The default function key definitions are as follows:

Function Key	Definition
f1	FIND
f2	FIND *
f3	FORGET
f4	EDIT
f5	PRINTER
f6	SORT
f7	BYE

Disk Specs

When you first boot *IS-Base*, the location of your data disk defaults to device 8 (drive 8). You can change this from drive 8 to drive 9 with the **DRIVE** command. Entering the command **DRIVE 9**, directs *IS-Base* to use drive 9 as its default drive. To change the default back to drive 8, simply enter the command **DRIVE 8**.

The following is a list of the files that are created on your data disk by *IS-Base*.

Filename	Function
IS-BASE.DAT	Holds all entered data
IS-BASE.KEY	Holds the function key definitions
IS-BASE.TMP	A temporary data file

Compiled BASIC

There are two versions of *IS-Base* on your HCJ Volume 3 disk. These versions are IS-BASE.BAS and IS-BASE.COM. The file IS-BASE.BAS is a Commodore BASIC 2.0 version of *IS-Base*. It is supplied on your disk so that you can see how the program works. We do *not* recommend that you run this version, as it is very slow. The file IS-BASE.COM is a compiled version of IS-BASE.BAS. This version can be **LOAD**ed, **SAVE**d, and **RUN** like any BASIC program. We recommend that you run the compiled version every time you use the program, as it operates much faster than its BASIC counterpart. We compiled *IS-Base* using the Abacus Software BASIC 64 compiler.

Explanation:

This format is a variation on the **FIND ALL** format. Search parameters are provided for either the left or right side of the **IS** command. Any information entered as "BUSINESS ASSOCIATE **IS** <...>" or "<...> IS BUSINESS ASSOCIATE" will be found.

Once a record is found using the **FIND ALL** format, however, the search goes one level deeper. You see, when the computer finds the line "JOHN PARKER IS A BUSINESS ASSOCIATE" it stops its search for "A BUSINESS ASSOCIATE" and goes looking for the name "JOHN PARKER" anywhere within the data file (left and right of the **IS** command, and even inside a statement like "*JOHN PARKER'S* ADDRESS IS"). When it finds "JOHN PARKER," that piece of information is output to the screen. When no more "JOHN PARKERs" can be found, the search resumes again for "A BUSINESS ASSOCIATE." This process is repeated when "CRAIG HENDERSON IS A BUSINESS ASSOCIATE" is found.

The All-Important *Wild Card*

Wild cards are one of the search parameter's most important features. If you have used DOS on an IBM PC or compatible, then you probably know what wild cards are and how much they can help. A wild card is a character that can represent one, none, or many characters. *IS-Base* uses the asterisk (*) character as a wild card. Because of this, you should *not* use asterisks when entering a piece of information with the **IS** command.

Let's say that you want to find all the information that you have on John Parker. You could enter the commands

```
?FIND JOHN PARKER
?FIND JOHN PARKER'S ADDRESS
?FIND JOHN PARKER'S PHONE NUMBER
```

and get all the information you have on him. But having to enter all three of these commands, would quickly become tiresome. The problem worsens when you start entering more information on John, such as business phone or date of birth. With wild cards, however, you can get *all* of John Parker's information with just one command:

```
?FIND *JOHN PARKER*
```

Here, no matter what appears before or after the name "JOHN PARKER," we find the proper information.

Wild cards are especially helpful when you can't remember exactly how you entered something into the database. By using wild cards, you can enter what you *do* remember, add a few wild cards in with your search parameters, and chances are that the computer will find the correct information. Use the command **FIND *** to find *all* information contained in the database.

Here are some examples on wild card matching: *DE matches ABCDE, JADE, and DE, but not DEAF or DEL. The string AB* matches ABCDE, ABSOLUTE, and AB, but not SCAB or TAB. The string *AN* matches ANT, FAN, AN and CANTELOPE. Finally, W*E matches WHALE, WHITE, and WE, but not WET or ANSWER.

Wild cards can be used *anywhere* within your search parameters, no matter which search parameter format you use. As you can see, wild cards add great flexibility to your *IS-Base* information retrieval.

All The Extras

Now that you've learned the "All You Need To Know" commands, and you've conquered search parameters, you're ready to learn the rest of *IS-Base's* commands. The following is a detailed explanation of *IS-Base's* extra commands. Once again, let's assume that the following has already been entered into the database using the **IS** command:

```
?JOHN PARKER IS A BUSINESS ASSOCIATE
?JOHN PARKER'S ADDRESS IS 675 ALDER, SPRINGFIELD,
MN 40735
?JOHN PARKER'S PHONE NUMBER IS (301) 285-2844
?CRAIG HENDERSON IS A BUSINESS ASSOCIATE
?CRAIG HENDERSON'S ADDRESS IS UNKNOWN
?CRAIG HENDERSON'S PHONE NUMBER IS UNLISTED
?A MYSTERIOUS FELLOW IS CRAIG HENDERSON
```

The <...> symbol represents information entered by you. All commands and keywords are in bold.

Command:
EDIT <...> **IS** <...>
or
EDIT <...>
or
EDIT WHAT IS <...> or **EDIT WHO IS** <...>
or
EDIT ALL<...>
or
EDIT ALL RELATED TO <...>

Example:

```
?EDIT JOHN PARKER IS A BUSINESS ASSOCIATE
 JOHN PARKER IS A BUSINESS ASSOCIATE
>JOHN PARKER IS A NEIGHBOR
```

Explanation:

This command allows you to edit information found in the database. Once a piece of information that matches your search parameters is found, it is printed to the screen and you are given the chance to change the information. In the example above, we have changed John Parker from a business associate to a neighbor. To

differentiate between the normal command mode and edit mode, you are given a greater-than sign (>) as an input prompt instead of a question mark (?). The original line is printed above the edit line for your reference. This way, it is easy for you to identify the changes you've made before pressing [RETURN] or [ENTER].

If you press [ESC] (back-arrow on the C-64), edit mode is aborted without any changes made to the information found. To abort edit mode on the TI-99/4A, just enter a blank line. If the **EDIT** command finds several matches to your search parameters, each piece of information found is brought up, one by one, for you to edit.

Command: **CHECK ON** and **CHECK OFF**
Example:

```
?CHECK ON
Definition check is on
?CRAIG HENDERSON'S PHONE NUMBER IS (221) 993-3772
Should I forget that-->CRAIG HENDERSON'S PHONE NUMBER
IS UNLISTED? Yes
CRAIG HENDERSON'S PHONE NUMBER IS UNLISTED --> Has been
forgotten
?CHECK OFF
Definition check is off
?CRAIG HENDERSON'S PHONE NUMBER IS NOW AVAILABLE
```

Explanation:

These two commands allow you to decide whether to forget old information because new, similar information is being added. When **CHECK** is **ON**, then newly entered information is checked against previously entered information for similarities. If a similarity is found, then you are asked if you wish to forget the old information. You may answer yes or no. To be considered similar, the information found on the left sides or right sides of the **IS** command must match perfectly on both the new and old information. In the example above, the phrase "CRAIG HENDERSON'S PHONE NUMBER" is what makes the two pieces of information similar. **CHECK OFF** turns this feature off.

Command: **KEY<...>**
Example:

```
?KEY1 IS A BUSINESS ASSOCIATE
?KEY2 FIND *
```

Explanation:

This command allows you to assign a group of characters to your function keys. The command **KEY1** defines function key 1, while **KEY7** defines function key 7. Whenever a function key is pressed, the characters assigned to that key are output. This can save much typing time when you are keying in several similiar types of information. The **KEY** command all by itself resets all function keys to their default definitions. For a list of the available function keys and their default definitions, see your computer's Spec Sheet.

Command: **SAVE KEYS** and **LOAD KEYS**
Example:

```
?KEY1 IS A BUSINESS ASSOCIATE
?KEY2 FIND *
?SAVE KEYS
```

Explanation:

These two commands allow you to save and load the current function key definitions to disk.

Command: **HELP**
Example:

```
?HELP
F1 - IS A BUSINESS ASSOCIATE
F2 - FIND *
F3 - FORGET
F4 - EDIT
F5 - PRINTER
F6 - CRUNCH
F7 - SORT
F8 - HELP
F9 - BYE
```

Explanation:

This command lists the current function key definitions.

Command: **PRINTER ON** and **PRINTER OFF**
Example:

```
?PRINTER ON
?FIND *
?PRINTER OFF
```

Explanation:

These two commands inform the program whether data should be sent to the printer or not. When the **PRINTER** is **ON** all information output to the screen is also output to the printer.

Command: **CLS**
Example:

```
?CLS
```

Explanation:

This command clears the screen. If **PRINTER ON** is activated, then a form feed is sent to the printer.

Command: **CRUNCH**
Example:

```
?CRUNCH
```

IS-Base Spec Sheet: IBM-PC/PCjr

Control Capsule

Key	Function
Cursor left	Move left
Cursor right	Move right
Backspace	Erase character left of cursor
Delete	Delete a character
Insert	Toggle insert mode
Home	Move cursor to beginning of line
End	Move to the end of line
Ctrl Backspace	Erase current entry
Enter	Accept entry
Ctrl Num Lock (PC)	Freeze screen/printer output
Fn Pause (PCjr)	Freeze screen/printer output
HOLD (Tandy)	Freeze screen/printer output
Esc	Escape current operation

Disk Specs

When you first boot *IS-Base*, the location of your data disk defaults to the active drive (usually drive A). You can change the default drive with the **A:** and **B:** commands. Entering the command **B:** directs *IS-Base* to use drive B as its default drive. To change the default back to drive A, simply enter the command **A:**.

The following is a list of the files that are created on your data disk by *IS-Base*.

Filename	Function
IS-BASE.DAT	Holds all entered data
IS-BASE.KEY	Holds the function key definitions
IS-BASE.TMP	A temporary data file

Function Keys

The **KEY** command is used to re-define the PC's function keys. Only function keys 1 through 9 are re-definable with the **KEY** command. Function key 10 always produces that last command that you entered. The default function key definitions are as follows:

Function Key	Definition
F1	FIND
F2	FIND *
F3	FORGET
F4	EDIT
F5	PRINTER
F6	SORT
F7	CRUNCH
F8	CLS
F9	BYE

Turbo Charged

The IBM version of *IS-Base* was written in Turbo Pascal, available from Borland International. Turbo Pascal compiles into .COM files that are executable from DOS. Because Turbo Pascal is a compiled language, it produces very fast and effecient programs. To run the IBM Version of *IS-Base* you may use the *HCJ Director* program or boot your system, insert your HCJ Volume 3 disk into the active drive, and enter IS-BASE at the DOS prompt.

IS-Base Spec Sheet: TI-99/4A

Control Capsule

Key	Function
FCTN S	Move left
FCTN D	Move right
FCTN 1	Delete a character
FCTN 2	Activate insert mode
FCTN 3	Erase current entry
ENTER	Accept entry
SPACE	Freeze screen/printer output (hold down)
FCTN 9	Escape current operation

Function Keys

Because the TI-99/4A does not allow programs to mask for different keypresses during an **ACCEPT AT** command, we were *not* able to add the function key option in the TI-99/4A version of *IS-Base*. Without function keys, the TI-99/4A version does not support the following *IS-Base* commands: **KEY**, **HELP**, **SAVE KEYS**, and **LOAD KEYS**.

Disk Specs

When you first boot *IS-Base*, the location of your data disk defaults to drive 1 (DSK1.). With the commands **DSK1.** and **DSK2.** you can change this from drive 1 to drive 2. Entering the command **DSK2.** directs *IS-Base* to use drive 2 as its default drive. Simply enter the command **DSK1.** to change the default back to drive 1.

The following is a list the files that are created on your data disk by *IS-Base*.

Filename	Function
IS-BASE_DT	Holds all entered data
IS-BASE_TP	A temporary data file

Printer Parameters

The default printer parameters for the TI-99/4A version of *IS-Base* are "RS232.BA=9600.DA=8". These parameters take effect whenever you use the *IS-Base* command **PRINTER ON**.

There are two ways in which you can change the default printer parameters. The first option is to use an *IS-Base* command that is unique to the TI-99/4A computer. This command is described below:

Command: **PR=<...>**
Example:

```
?PR=PIO
```

Explanation:

This command allows you to change the printer parameters.

The second option for changing the default printer parameters is to edit line 220 of the program file IS-BASE so that it sets the variable **PR$** to the parameters of your choice.

Note: This program requires Extended BASIC, but *not* the 32K Memory Expansion. If you own the 32K Memory Exansion, however, we suggest that you use it.

Explanation:

If you have made several deletions to the your data file, it is possible to shrink the data file so that it takes up less room on the disk and is searched more quickly. The **CRUNCH** command goes through and compacts your data file. This option is not available on the Commodore 64 because the data file is always kept "crunched" in the C-64 version of *IS-Base*.

Command: **SORT** or **SORT LEFT** or **SORT RIGHT**
Example:

```
?SORT
```

Explanation:

Data is saved and listed in the order in which it is entered. The **SORT** command allows you to change this order. A **SORT** or **SORT LEFT** alphabetically sorts your file according to the left side of each statement (everything left of the **IS** command). A **SORT RIGHT** alphabetically sorts your file according to the right side of each statement (everything right of the **IS** command).

Command: **BYE**
Example:

```
?BYE
```

Explanation:

This exits the *IS-Base* program and returns you to the standard power-on state of the computer. Because your data is always stored to disk, there is no need to worry about lost data when leaving the *IS-Base* program.

Sample Databases On Disk

Because of its flexibility, *IS-Base* can keep track of any type of information that you wish to store: addresses, magazine indexes, record collections, trivia questions, inventories, etc. To get you started, we have provided two sample files on your HCJ Volume 3 disk. In the file CAPITALS, we have entered the capitals of the United States. In the file MADONNA, we have entered information (song titles, writers, and musicians) about the musical pop star Madonna's first three record albums.

To use either of these files, you must first copy the data file (CAPITALS or MADONNA) to an empty data disk using the file name that your version of *IS-Base* recognizes as its data file. On the Apple, this means copying the data file of your choice (using the Filer program provided on your HCJ Volume 3 disk) to the new data disk with ISBASE.DAT as the file name. On the C-64, copy the data file (using one of the file copier programs supplied with your disk drive) to the new data disk with IS-BASE.DAT as the file name. On IBM or compatibles, copy the data file (using DOS) to the new data disk with IS-BASE.DAT as the file name. On the TI-99/4A, copy the data file (using the Disk Manager Cartridge) to the new data disk with IS-BASE_DT as the file name. These file names are described in the Spec Sheet for your computer.

The CAPITALS file shows off *IS-Base's* educational possibilities. With all of the states' capitals at your fingertips, you can use *IS-Base* to quiz yourself or a friend on geographical knowledge. The capitals were entered in the following format:

```
?THE CAPITAL OF ALASKA IS JUNEAU
?THE CAPITAL OF CALIFORNIA IS SACRAMENTO
etc.
```

So, to find the capital of South Dakota, for example, simply enter the following command:

```
?FIND THE CAPITAL OF SOUTH DAKOTA
Found:
THE CAPITAL OF SOUTH DAKOTA IS PIERRE
```

To find the state that a particular capital city is located in, enter this:

```
?FIND WHAT IS TALAHASSEE
Found:
THE CAPITAL OF FLORIDA IS TALAHASSEE
```

The MADONNA file emphasizes *IS-Base's* indexing and searching capabilities. This file identifies all songs on the three albums by album and by songwriter(s). For example, it's easy to find out both the songwriter and which album contains the song *La Isla Bonita* by using the **FIND** command:

```
?FIND LA ISLA BONITA
Found:
LA ISLA BONITA IS ON THE ALBUM TRUE BLUE
LA ISLA BONITA IS WRITTEN BY MADONNA, PATRICK LEONARD,
AND BRUCE GAITCH
```

As this example shows, we've entered all song titles on the left side of the **IS** command. Because of this, we don't need to use the **FIND ALL** format to locate information about any of the songs. Now, let's say we want to find out more about a particular songwriter. If we just enter **FIND ALL** PATRICK LEONARD, here is the result:

```
?FIND ALL PATRICK LEONARD
Found:
PATRICK LEONARD IS A PRODUCER OF THE ALBUM TRUE BLUE
PATRICK LEONARD IS DOING DRUM MACHINE PROGRAMMING ON
THE ALBUM TRUE BLUE.
```

Using wild cards (*), however, will give you even more information. Try entering the following command on your own computer to discover Patrick Leonard's other songs:

```
?FIND ALL *PATRICK LEONARD*
```

Be sure the MADONNA file has been properly renamed for your computer system, as explained above.

Crossword Composer

You think up the words, the computer interleaves them into a puzzle.

If you've ever tried to create a crossword puzzle, then you know what frustration is. Attempting to fit a slew of words into one cohesive group is no small task. Such a procedure is time consuming and requires a lot of patience. This type of trial-and-error letter matching, however, is perfect for a computer. Computers never get bored; they think quickly; and they just "love" repetitive operations. The program *Crossword Composer* really gives your computer a chance to show off these talents. With *Crossword Composer*, you enter up to 100 words and then let the *computer* fit the words together.

Crossword Composer operates from one main screen (see Figure 1). The Puzzle Box appears on the left. This box contains your crossword puzzle. The Puzzle Box is 20 characters wide and 20 characters tall. When you first run the program, this box is empty. Directly above the Puzzle Box is the title of the puzzle. The title is determined by the file name used when you save your puzzle. The puzzle's title remains "UNTITLED" until you save or load a puzzle.

On the right side of the screen is the program's menu. A selected menu option appears highlighted. To select an option, use your computer's cursor-up and cursor-down keys. To activate the selected option, press [RETURN] ([ENTER] on the IBM and TI-99/4A). The menu options are:

Edit Words	Save Puzzle
Make Puzzle	Load Puzzle
Erase Puzzle	Future Plans
Print Puzzle	Exit Program

Edit Words

Before you can create a puzzle, you must enter the words and clues that will make up the puzzle. Words and clues are entered and edited by choosing the Edit Words option.

When you select this option, you are brought to the Edit Words' screen (see Figure 2). This screen shows five boxes at a time (4 on the TI-99/4A). These boxes are where you enter your words. Each box is numbered (0 through 99), informing you which of the 100 words you are currently editing. The screen line below each box is where you enter the word's clue. Using your cursor keys, you can move from word to clue, clue to word, etc.

When you attempt to move the cursor off the screen, the screen updates to display the next or previous words in the list (depending on whether you were moving up or down). By using certain keypresses, you can jump through the word list a screen at a time, or just a word at a time. There are also keypresses for cutting and pasting words to and from the word list. For a complete list of Edit Word's editing functions, refer to your computer's Control Capsule.

Words cannot contain spaces—any spaces found in a word are taken out before the word is placed into the puzzle. Also, words must be two or more letters in length. Words do not have to have clues, but crossword puzzles without clues are not much fun!

The Order Of Words

The order in which you enter words can determine the final look of your puzzle. When the computer assembles your crossword, it places one word at a time into the puzzle, moving sequentially through the word list. For best results, therefore, you should put your longest words at the top of the list. This way, the computer will have an easier time placing the words found at the bottom of the list. For the same reason, it's a good idea to include words with commonly used letters at the top of the list. The editor's cut-and-paste functions aid considerably in the reordering of words. The order of words is not entirely critical, however, because the computer repeatedly cycles through the word list, placing any words that could not fit in the first pass. Just remember: a little forethought can help in producing a more complete puzzle.

Pressing [ESC] (back-arrow key on the C-64 or [FCTN] 9 on the TI-99/4A) exits the word editor and returns you to the main menu screen.

Make Puzzle

This option allows you to make a crossword puzzle using the words currently in the word list. While making a puzzle, the screen line directly below the puzzle box shows which word is currently being placed, while the line below that displays your options, including the keypresses you use to access these options.

The first step to making a puzzle is to place the first word inside the Puzzle Box. Your options for placing the first word are: (1) accept the current position of the word, (2) toggle the word between being displayed across or down, or (3) move the word within the Puzzle Box using the cursor keys. Because this is the first word in the Puzzle Box, it can be placed anywhere within the Puzzle Box's boundaries.

Once the first word is placed, all following words offer these options: (1) accept the current position of the word, (2) relocate the word in the puzzle, or (3) use the word at a later time. When a word is placed into the puzzle, the word appears in the Puzzle Box in reverse video. As described previously, you can accept the current location of the word, or relocate the word. Using the Relocate option, you can cycle through all of the word's possible positions; this may be several positions, or just one. The Use Later option comes in handy when you do

Figure 1.
This is Crossword Composer's main screen. The program's menu appears on the right.

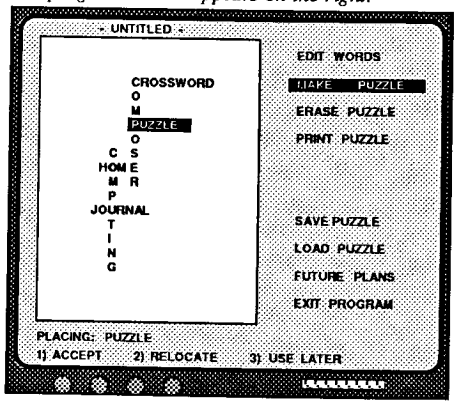
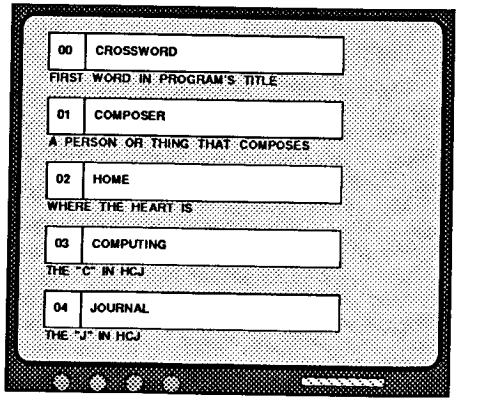


Figure 2.
This is the Edit Word's screen. The puzzle's words appear in boxes with their clues below.



Crossword Composer Spec Sheet: Apple II

Control Capsule

Edit Word Mode

KEY	FUNCTION
Delete	Delete a character
CTRL I	Insert a space
RETURN	Move to clue or next word
Cursor down	Move to clue or next word
Cursor up	Move to word or previous clue
CTRL Q	Move to previous word/clue
CTRL A	Move to next word/clue
CTRL W	Move back by 5 words
CTRL S	Move forward by 5 words
CTRL X	Cut word/clue from list
CTRL V	Paste word/clue into list
ESC	Return to menu

To run the Apple version of *Crossword Composer*, simply **LOAD** and **RUN** the program file CROSSWORD. You may also use the HCJ Director program. This program should be run in 40-column mode only. If your computer supports 80-column mode, be sure it is not active when you run this program.

Printer Drivers

There are two different printer drivers on the Apple HCJ Volume 3 disk:

File name	Printer
`ALL.PRT`	Any printer—no graphics
`EPSON.PRT`	Epson-compatible dot-matrix printers

The program file CROSSWORD has the ALL.PRT driver installed. In order to use the Epson-compatible printer driver, you must install it into the CROSSWORD program. To install a driver, follow these steps:

1) **LOAD** the CROSSWORD program. For example:

```
LOAD CROSSWORD
```

2) **BLOAD** the printer driver of your choice. For example:

```
BLOAD EPSON.PRT
```

3) **SAVE** the program under the file name of your choice. For example:

```
SAVE CROSSWORD.EPSON
```

Because the HCJ disk is write-protected, you must use a backup of the disk to complete this procedure.

File Names

File names for saving and loading puzzles can be up to 11 characters in length. When saved to disk, your file will appear in the directory with a .PUZ extension. You must use prefixes to specify which disk/drive you want to access. Everytime you enter a file name, a default prefix is supplied (usually indicating the disk in slot 6, drive 1). So, if you don't mind the current prefix, you can simply enter your file name and press **[RETURN]**.

not like any of the positions where the word can currently be placed. Choosing this option simply sets the word aside, where it will be used again after the rest of the words in the list are placed. Take note: To avoid interjecting new unsolicited words into the puzzle, words are *never* placed directly next to another word.

This process repeats for every word in the list, until the puzzle is complete. If any words did not fit into the puzzle, then the computer tells you which words were not used.

If you have a puzzle already assembled in the Puzzle Box when you select the Make Puzzle option, that puzzle will be cleared in preparation for your new puzzle. When rebuilding a puzzle, however, the computer always tries to place the words in their previous positions—duplicating your original puzzle. This way, you can make modifications to the puzzle's words or format without totally disrupting its look. If you modify the puzzle's words too drastically, or simply take an important word from the list, the computer probably will not be able to re-create the format of the previous puzzle.

Editing Words After Making A Puzzle

If you have a puzzle assembled in the Puzzle Box when you enter Edit Words, you'll see asterisks to the right of some of the words in the word list. These asterisks signify that a word is currently being used in the puzzle. Words that did not fit into the puzzle do not have an asterisk. You can use this information to weed out these "outcast" words, or to relocate them in the list.

If you do not want to disrupt your current puzzle, you must be cautious of how you treat words with asterisks. If you delete, or even change the spelling of a word that is used in the puzzle, your puzzle is cleared and you are forced to rebuild it. You see, by modifying a word that is used in the puzzle, you have corrupted the position of other words. Of course, you can do whatever you want with words not marked by an asterisk.

Erase Puzzle

If you want to clear the current puzzle from memory and start from scratch, choose this option. The Erase Puzzle option clears the puzzle from the Puzzle Box, erases all words in the word list, and resets the puzzle's title to "UNTITLED." Because of the serious nature of the Erase Puzzle option, you are asked if you really want to erase the puzzle. If you stumbled into this option by mistake, simply answer NO.

Print Puzzle

Once you have made a puzzle that you are satisfied with, you will want to print your puzzle. Three pages are produced when you choose this option. The first page is the problem page, displaying the numbered boxes in which the words are entered. The second page is the clue page (clues may take up more than one page, depending on the number of words in your puzzle). The third and final page is the puzzle's solution. You may wish to keep this page when challenging someone with your puzzle.

In order to optimize this all-important print feature for your computer-printer setup, we offer two different types of printout. The default printer method uses only characters to create the puzzle—employing asterisks to draw the puzzle box. This method works with all printers including daisy wheel printers.

We also allow for a more elegant graphic output by including special "printer drivers" on each computer's disk. (A printer driver is simply the software necessary for a program to send special output to a printer.) This graphic method is more time consuming, but the result is superior. In order to get a graphic printout, your program needs to have a special printer driver installed in it. Also, due to the printer-specific nature of graphic printing, only certain types of printers can take advantage of this option. See your computer's Spec Sheet for more information on installing printer drivers, and what type of printer is supported for your computer.

Save Puzzle & Load Puzzle

These options allow you to save and load the words in the word list along with any puzzle in the Puzzle Box. The file name used when saving or loading a puzzle becomes the puzzle's title. For details on legal file names, see your computer's Spec Sheet.

Future Plans

Well, all good programs should leave room for expansion, and this is where we left room in *Crossword Composer*. "What type of expansion?" you ask. Maybe the next volume of HCJ will tell. Anyway, the program's screen just wasn't as attractive with only 7 options.

Exit Program

Be sure to save your puzzle before quitting. For safety's sake, however, you are asked if you are sure that you want to quit before the program aborts.

Sample Puzzles

To get you started, we have provided a puzzle of our own on the HCJ Volume 3 disk. To load this puzzle, select the Load option in *Crossword Composer* and enter GUITAR as its file name. Can you solve this puzzle without looking at the solution?

Crossword Composer Spec Sheet: C-64

Control Capsule
Edit Word Mode

KEY	FUNCTION
RETURN	Move to clue or next word
Cursor down	Move to clue or next word
Cursor up	Move to word or previous clue
F1	Move to previous word/clue
F3	Move to next word/clue
F5	Move back by 5 words
F7	Move forward by 5 words
F2	Cut word/clue from list
F4	Paste word/clue into list
Back arrow	Return to menu

To run the C-64 version of *Crossword Composer*, simply **LOAD** and **RUN** the program file CROSSWORD. You may also use the HCJ Director program.

Printer Drivers

There are two printer drivers on the C-64 HCJ Volume 3 disk:

File name	Printer
`ALL.PRT`	Any printer—no graphics
`EPSON.PRT`	Epson-compatible dot-matrix printers

The program file CROSSWORD has the ALL.PRT driver installed and the program file CROSSWORD.EPSON has the EPSON.PRT driver installed. So, you can just load and run the program of your choice—the only difference being printer drivers.

Although we provide versions of *Crossword Composer* with the different printer drivers already installed, it is possible to install a driver yourself. To install a driver, follow these steps:

1) **LOAD** the CROSSWORD program. For example:

```
LOAD "CROSSWORD",8
```

2) **LOAD** the printer driver of your choice (using a **,1** extension). For example:

```
LOAD "EPSON.PRT",8,1
```

3) Execute a **SYS 3558** and **SAVE** the program under the file name of your choice. For example:

```
SYS 3558
SAVE "CROSSWORD.EPSON",8
```

Because the HCJ disk is write-protected, you must use a backup of the disk to complete this procedure.

File Names

File names for puzzles can be up to 12 characters in length. When saved to disk, your file will appear in the directory with a .PUZ extension. Puzzles are saved as program files, but they are not to be loaded as such!

Crossword Composer Spec Sheet: IBM

Control Capsule
Edit Word Mode

KEY	FUNCTION
ENTER	Move to clue or next word
Cursor down	Move to clue or next word
Cursor up	Move to word or previous clue
F1	Move to previous word/clue
F2	Move to next word/clue
Page up	Move back by 5 words
Page down	Move forward by 5 words
F3	Cut word/clue from list
F4	Paste word/clue into list
ESC	Return to menu

To run the IBM version of *Crossword Composer*, simply enter **CROSS** at the DOS prompt. You may also use the HCJ Director program.

Printer Drivers

There are two printer drivers on the IBM HCJ Volume 3 disk:

File name	Printer
`IBM.DRV`	IBM compatible dot-matirx printers
`EPSON.DRV`	Epson compatible dot-matrix printers

If you do not use one of the above printer drivers, this program prints the puzzle using asterisks for the puzzle boxes, and is compatible with all printers. To use one of these printer drivers, all you have to do is copy the printer driver of your choice to the file name PRINTER.DRV. This can be done from DOS using the following command:

```
COPY IBM.DRV PRINTER.DRV
     or
COPY EPSON.DRV PRINTER.DRV
```

Because the HCJ disk is write-protected, you must use a backup of the disk to complete this procedure.

Basically, when *Crossword Composer* is first run, it searches the disk for the PRINTER.DRV file, and if found, it installs that printer driver. For this reason, the PRINTER.DRV file must be in the active drive when *Crossword Composer* is run, or the driver will not get installed. For ease of use, we suggest that you copy your printer drivers onto the same disk as the crossword program.

File Names

File names for saving and loading puzzles can be up to 8 characters in length. When saved to disk, your file will appear in the directory with a .PUZ extension.

Crossword Composer Spec Sheet: TI-99/4A

Control Capsule
Edit Word Mode

KEY	FUNCTION
ENTER	Move to clue or next word
FCTN X	Move to clue or next word
FCTN E	Move to word or previous clue
CTRL 4	Move to next word/clue
CTRL 6	Move to previous word/clue
FCTN 4	Move forward by 4 words
FCTN 6	Move back by 4 words
CTRL 1	Cut word/clue from list
CTRL 2	Paste word/clue into list
FCTN 9	Return to menu

To run the TI-99/4A version of *Crossword Composer*, simply **OLD** and **RUN** the program file CROSSWORD. You may also use the HCJ Director program. This program uses upppercase letters only, so it is advised that you keep the **[ALPHA LOCK]** key down at all times.

Printer Driver

When you run the program file CROSSWORD, it will default to using asterisks for drawing boxes on any printer. If you prefer a more elegant graphic output, and own an Epson-compatible printer, you can use the EPSON_DRV printer driver.

To use the Epson printer driver, all you have to do is copy the file EPSON_DRV to the new file name PRINTER_DRV. This can be done using the Disk Manager's Copy File option. Because the HCJ disk is write-protected, you must use a backup of the disk to complete this procedure.

Basically, when *Crossword Composer* is first run, it searches the disk for the PRINTER_DRV file, and if found, it installs that printer driver. For this reason, the PRINTER_DRV file must be in DSK1 when *Crossword Composer* is run, or the driver will not be installed. For ease of use, we suggest that you copy the printer driver onto the same disk as the crossword program.

File Names

File names for saving and loading puzzles can be up to 8 characters in length. File names must be preceded by the device (i.e., DSK1.). When saved to disk, your file will appear in the directory with a _X extension.

Perfect Puppy

You've heard of Pavlov's dogs, but have you heard of HCJ's Perfect Puppy? Just like those obedient canines, our own cyber-pup learns from both positive and negative reinforcement.

Can a computer learn? Of course it can. Just type in a program and the computer will do just what you've told it to. But, is that *intelligence?* Just because a computer can be programmed to play a game, doesn't mean it has really learned anything. Discussions of this type can be heard in computer circles around the world, and in educational institutions—from grade school to graduate school.

To help you get some first-hand experience with these issues, we've designed a program to show one way a computer can be programmed to learn—by allowing it to observe correct responses to given situations, and be able to respond in a like manner when confronted with those situations. Because the program starts with a blank slate, and learns *only* exactly what you teach it—no matter how good or bad a teacher you are—we call it the *Perfect Puppy*.

Before we get into the explanation, realize that this program does *not* pretend to demonstrate the latest in artificial intelligence, nor is it the *only* way to teach a computer to play a game. It is, however, *one* way to show how the computer—with some easy-to-understand BASIC—can simulate a learning process. In fact, if you *are* a good teacher, you can teach the *Perfect Puppy* to win nearly every game it plays.

The Game

The game we've chosen to teach our cyber-pup is relatively simple—but, if you've never played it before, requires enough strategy to be quite challenging. The game plays an important part in a 1961 French movie called "Last Year at Marienbad." One of the characters in the movie states that he knows a game he can always win.

"If you can't lose," his opponent counters, "it's not a game!"

"I can lose," he responds. ". . . But I always win."

The game takes two to play. Sixteen match sticks are arranged in rows of one, three, five, and seven. Each player picks up sticks in turn (as many sticks as he wants) on the condition that he takes from only one row each time. The one who picks up the last stick has lost. We designate the rows A, B, C, and D. Thus, you move by choosing one of the four letters to choose a row, and then selecting the number of sticks you wish to remove. When the program runs for the first time, it knows the rules of the game, and properly declares the winner at the end. But, because it has no knowledge of a good or bad move (providing that you don't first load in any experience), it chooses its moves at random.

Running The Program

When you run *Perfect Puppy*, you are first asked if you wish to load the computer's memory with game experience. As the computer plays, it notes the moves that lead to a win or a loss, and this knowledge guides its own future play. This knowledge can be saved to disk at the end of any session, and can be reloaded the next time the program is run. By giving these files different names, you can have several knowledge bases to experiment with. We've included one file called SMARTS.AI for you to get started with. Note that the .AI extension is added by the program, and should *not* be entered by the user.

Next you are presented with the main menu:

```
1) HUMAN MOVES FIRST
2) COMPUTER MOVES FIRST
3) HUMAN VS HUMAN
4) COMPUTER VS COMPUTER
5) AUTO-LEARN MODE
6) QUIT
```

In the first two options, you play against the computer. If you have not loaded a knowledge file, the computer plays totally at random, choosing any available move. Against a reasonably aware opponent, the computer nearly always loses. It *can* win, but it rarely does.

Beating the computer, however, is *not* the idea. Rather, it is your job to improve the computer's game by teaching it the best moves, and *not* teaching it bad habits. Like a puppy, the program mimics moves that are rewarded by winning, and tends to shun moves that lose. If you play a game perfectly, only to make a foolish move at the end, your puppy views all of your moves in that game as bad moves, and your teaching task will be made harder. This is analogous to punishing your puppy when he scratches your freshly painted door while signaling his desire to go outside to do his business.

Option 3, Human vs. Human, allows you to play against another person, or teach your puppy certain patterns of moves by controlling both sides. The computer never stops observing and modifying its knowledge base, so even though it is not actively in the game, its expertise will improve if it "watches" two good players.

Option 4, Computer vs. Computer, pits the computer against itself. This is a good observing mode, so you can check to see if there is some response in your puppy's knowledge base that you have not noticed when playing against it yourself. The computer might even teach you a thing or two in this mode.

In option 5, Auto-Learn Mode, the computer and an opponent (Mr. Random) take turns going first, and keep playing until they are stopped. To stop Auto-Learn Mode, press [ESC] (back-arrow on the C-64, [FCTN] 9 on the TI). This mode is excellent for getting a knowledge base started, because the computer is eventually faced with nearly every situation. But keep in mind that Mr. Random does *not* necessarily make the best move; therefore, even after several hours of this mode, your puppy will need some careful tutoring to become a really good player.

When you Quit, option 6, be sure to save the computer's knowledge so you won't have to start from scratch when you start the next session.

Game Notation

The current number of match sticks in each row (the board position) is kept in the string variable **BD$**. Every time a move is made, **BD$** is updated to reflect the new board position. The board position is stored as 4 characters. The first character reflects the number of match sticks in row A, the second character reflects the number of match sticks in row B, and so on.

The initial board position (1 stick in row A, 3 sticks in row B, 5 sticks in row C, and 7 sticks in row D) is represented as "1357" in **BD$**. If you were to remove 3 sticks from row B in your first move, "1057" would be the resulting board position. The four board positions "1000", "0100", "0010", and "0001" signify the end of the game.

In order for our puppy to learn from a game, it must keep track of the game's moves. Each move in a game is stored in the string array **GM$( )**. The first move of the game is stored in **GM$(1)**, the second move in **GM$(2)**, and so on. The current move number is kept in the variable **MV**.

Moves are stored in a seven-character format. The first four characters represent the board position (see above). The fifth character is always a space. The sixth character represents the row (A-D), and the seventh and last character specifies the number of match sticks removed. If you were to remove 4 match sticks from row C in the first move of the game, for example, the string notation "1357 C4" would be placed into **GM$(MV)**.

The total number of moves in a game is recorded in the variable **NM**. If you wish to list all of a game's moves, you could do so by breaking the program after a game and entering the following code:

```
FOR I=1 TO NM :: PRINT GM$(I) :: NEXT I
```

The double colons are only necessary for TI-99/4A computer owners. Both double and single colons are acceptable command separators on other machines.

Dog Brains

Perfect Puppy learns from experience: Good behavior (winning) is rewarded, and bad behavior (losing) is punished. (Note: Here, you can forget about that noble maxim "It's not whether you win or lose . . .") In order for *Perfect Puppy* to remember what is good and bad behavior, we had to supply our young canine with a memory or brain. This brain is provided by the string array **WM$( )**. Winning moves are moved into this array, while losing moves are removed. At the start of the program, this array is empty.

Each array element in **WM$( )** makes up a brain cell, and each brain cell keeps track of the winning moves for a particular board position. Indexing into a brain cell is done in a very simple matter. For example, winning moves for board position "1354" are stored in **WM$(1354)**, while winning moves for board position "0211" are stored in **WM$(211)**. So, at any time during the game, **WM$(VAL(BD$))** returns the winning moves (if any) for the current board position. (One point of interest: With 383 possible board positions and 1357 brain cells, only about 3% of *Perfect Puppy's* brain cells are actually ever used. Remind you of any dogs you've met?)

Winning moves are stored in **WM$( )** in the same format as game moves are stored in the last two characters of the **GM$( )** array with the first character representing the row, and the second character representing the number of match sticks to be removed. Several moves may be stored in **WM$( )**. For example, the board position indicated by **WM$(1536)** may contain "C3B1A1C1B2" as its winning moves. This example offers the 5 winning moves C3, B1, A1, C1, and B2. It is very possible that there will be just one, or no winning moves stored for any board position.

Brain cells organize moves in order of preference: Superior moves appear ahead of inferior moves. Using the previous example, we see that our *Perfect Puppy* prefers the move C3 over B1, B1 over A1, A1 over C1, and C1 over B2. Hoping to make the correct response, *Perfect Puppy* always uses the *first* move found in a brain cell.

If you wish to delve further into *Perfect Puppy's* inner workings, see Key Variables and the accompanying sidebar, Learning To Win.

Key Variables

Variable	Function
WM$( )	Stores winning moves
GM$( )	Stores current game's moves
BD$	Current board position
PL	Current player (0 or 1)
MV	Current move number
NM	Total number of moves

Learning To Win

Perfect Puppy evaluates each game, trying to learn some winning moves. This learning process involves looking at *both* player's moves, and updating the **WM$( )** array (*Perfect Puppy's* brain) accordingly.

Each move made by the winning player is placed into the brain cell corresponding to the board position in which the move was made. Consider the case when the winning player removes 1 stick from row A in the following board position:

```
A) |
B) | |
C) | |
D)
```

The string "A1" is placed into **WM$(1220)**. If **WM$(1220)** already contains the move A1, then the A1 move is bumped up by one move in the list. If the move A1 is already first in the list, then no change is made. If A1 is not already in the list, then the move A1 is placed as the first move in the list. Here are some before-and-after examples:

	Before	After
WM$(1220) =	""	"A1"
WM$(1220) =	"B1B2A1C1"	"B1A1B2C1"
WM$(1220) =	"A1B1B2"	"A1B1B2"
WM$(1220) =	"B1B2"	"A1B1B2"

Each move made by the losing player is removed from the brain cell corresponding to the board position in which the move was made. Consider the case when the losing player removes 2 sticks from row C in the following board position:

```
A) |
B) | | |
C) | | |
D) | | | | |
```

The string "C2" is removed from, or lowered in importance from **WM$(1335)**. If **WM$(1335)** already contains the move C2, then C2 move is bumped down by one move in the list. If the move C2 is already last in the list, then C2 is removed from the list. If C2 is not already in the list, then no change is made. Here are some before-and-after examples:

	Before	After
WM$(1335) =	"D4C2A1"	"D4A1C2"
WM$(1335) =	"D4A1C2"	"D4A1"
WM$(1335) =	"A1D4B2"	"A1D4B2"

It Figures!

Whatever your problem, you can reach a solution... but you must have the right formula!

Note: The program *It Figures!* was originally published in Vol. 5, No. 2 of Home Computer Magazine for the Apple, C-64, IBM PC, PCjr, and TI-99/4A. Here, we present an Atari version of this mathematical-powerhouse.

Are you a physics student working with motion equations? Or a worker planning a savings strategy? Or perhaps a home owner figuring the cost of a new carpet? Many of us often encounter situations in which we want quantitative results only a mathematical formula will provide. If only we could just run to the computer, type in the proper formula, enter some values, and get a quick solution...

It Figures! is a handy mathematical tool designed to do just this job. It allows you to use up to 8 variables to create even a complicated formula, and then calculate its answer. Think of a variable as being a bucket: we identify each bucket with a name or symbol, then we fill them with different numeric values. (We're not going to consider string variables in this program.) When we express some mathematical relationship between the different buckets (variables), we have put together a formula that can be evaluated for all the possible variations in the contents of each bucket.

In this program, each variable can be assigned both a value and a formula. If there is no value (or a value of zero) assigned to a variable, its equation, when calculated, will yield a value for it—depending on the values in the other variables. If the other values in a formula are changed, and the formula is recalculated, the value of the current variable will also change. For example, we will assign these 3 variables the following values:

A=12
B=20
C=25

A has the formula **B+C** and the value 12 assigned to it. If we calculate **A**, it will use the current values for the variables within the formula **B+C** and place the result back in **A**. After the calculation, **A** will have a value of 45. A variable can also appear within its own formula. For example, the formula for **A** could have been **A+B+C**, which—when calculated—would have placed 57 into **A**. Notice that when **A** was used inside its own formula, that the current value for **A** (12) was used to calculate a new value. The program does not update a value for a variable encountered within its own formula until the entire calculation is complete. Only the current value (the one last calculated) is used.

CONTROL CAPSULE

It Figures!

KEY	FUNCTION
CTRL E	Move to formula-edit field
CTRL P	Print formulas
CTRL L	Load formulas
CTRL S	Save formulas
CTRL C	Caclulate a variable
RETURN	Tab between fields
ESC	Exit program

Numeric Functions

Every numeric function available in BASIC is incorporated into this program. A list of available functions is as follows:

Command	Function
ABS	ABSolute value
ATN	ArcTaNgent
CLOG	LOGarithm
COS	COSine
EXP	EXPonent
INT	INTeger
LOG	LOGarithm
RND	RaNDom number
SGN	SiGN
SIN	SINe
SQR	SQuare Root

For a detailed explanation of each function, consult your BASIC reference manual. The syntax for each function is: **FN(P)** where **FN** is the function name, and **P** is the parameter. For example, you would designate the sine of **A** as **SIN(A)**.

Using The Program

It Figures!'s screen is divided top to bottom into 3 main "windows": a variable list, a formula window, and a "help" window. The upper window is also divided into a value field and a variable label field. Eight variables are displayed in this upper window. Each variable row includes (left to right) the variable letter, an equal sign, the value of the variable, a colon, and the variable label field. The value and label fields can be edited with the edit keys (insert, backspace, delete, etc.). To move between these two fields, press **[RETURN]**. To move from one variable to another, press **[RETURN]** until the cursor is located on the current variable name, then use the cursor-up or cursor-down key to move to the desired variable.

To make it all easier to understand, we will take you through each step of the program, using an example formula that calculates the "future value" of a savings deposit. The formula is:

B*((C+1)^D)=A

where:

A is the future value of the deposit
B is the present value
C is the interest rate.
D is the number of years compounded

To assign a value to any variable, simply move to its value field and type in the value—then move to the label field and type in a label. For example, move to **A**, leave the value as **0** (it's our unknown), and then move over and enter **FUTURE VALUE** as a label. Next, move back to the variable name, move down to **B**, enter **1000** as a value and **PRESENT VALUE** as a label. Continuing on, enter **C** equal to **.0525** and label it **INTEREST PER YR**; then enter **D** equal to **12** and label it **YEARS**.

You can also assign a formula to any variable. To do this, move the cursor to the row containing the variable and press **[CTRL] E**. In this case, move to **A** and press **[CTRL] E**. The cursor will appear in the formula window and the current value field for **A** will be displayed below the cursor (as **A=0**). The current value to be calculated will always be displayed here, along with its assigned formula.

If there were already a formula assigned to this variable, the formula would be displayed in the formula window, and the cursor would be on the first character of the formula. Because there is no formula yet, the cursor is on the first character position of the formula to be entered.

From this point, the formula can be created or edited using the editing keys. To complete entry in the formula window, press the **[RETURN]** to return to the variable field you left when the formula field was called. The last formula you worked on will continue to be displayed in the formula window until another formula is worked on or created.

Now, try entering the Future Value formula shown on the previous page.

Calculating

You can calculate any formula for a variable by moving the cursor to a row that contains the variable you want to calculate. To solve that variable's formula, press **[CTRL] C**. As yet, we have only entered a formula for **A**, to calculate the future value of our $1000 deposit. Try moving to **A** in the value field and press **[CTRL] C**. After a few moments, you will see a calculated value appear both in the value field in the upper window, and after the current variable displayed in the formula window. You can now assign formulas to any other variables, such as this formula for **D** (years or times compounded):

(LOG(A/B))/(LOG(C+1))

Or, you could define a new unknown variable—like **E** for **INTEREST EARNED**—and assign it a formula, such as:

(B*((C+1)^D))–B or **A–B**

You might notice that if you enter both of these formulas and try some examples, they may not come up with precisely the same answer. This is due to the limited accuracy of your computer.

As an aid to increased understanding of how this versatile tool may be called upon to perform its useful, numerical magic, we have provided more examples in Figure 1. You may use these just for practice—or, for a practical purpose. (Although the sample formulas we give here are fairly simple, the program can handle any complicated formula as large as 78 characters.)

Further Options

By pressing the **[CTRL] P**, you can get a hard copy of the current contents of your variables, their present values, their labels, and the formula.

You can save and recall your variables and formulas with a disk. Every time you save a file, you are saving *everything* in memory, including all present values. You may update a file by saving to the same file name; or you may save to a new name, creating a new file to hold your latest changes.

A Note On Formulating

This program works through any formula exactly how the BASIC interpreter would. Operations within the innermost set of parentheses are performed first and proceed out to the next level. Operator precedence is as follows:

Highest Precedence
^
* and /
+ and -
NOT
AND
OR
Lowest Precedence

You must take this into account when entering a formula, because the order of operations is very important in getting the proper result.

Figure 1
Sample Formulas

1. To calculate the height a rocket will reach in a certain time if the initial velocity is known:

(B*C)–((D/2)*(C^2))=A

where
A is the height reached (feet).
B is the initial velocity (feet/second).
C is the time in seconds.
D is the gravitational acceleration (32/ft./sec./sec).

2. To calculate the cost of material (carpet, siding, etc.) covering a certain area:

B*C=A

where
A is the total cost.
B is the cost of material ($ per sq. ft.).
C is the surface area (sq. ft.).
If **B** is in square yards, the formula is: **B*(C/9)=A**

3. To convert ounces to grams:

B/C=A

where
A is the number of grams.
B is the number of ounces.
C is the conversion factor (.035 in this case).

This formula can convert virtually any U.S. weight or measure to metric with the appropriate conversion factor obtainable from most common dictionaries.

Savings Planner

Computer-assisted savings planning to the rescue. . .

Note: The original version of this program, written for the TI-99/4A, was published in the April, 1983 issue of 99'er Home Computer Magazine. Later, versions for the Apple, C-64, Vic 20, IBM PC, and PCjr appeared in Vol. 4, No. 1 of Home Computer Magazine and again in ON DISK Revue™ Volume 1. Here, we present an Atari version of the ever-popular *Savings Planner.*

When it comes time to make an expensive purchase—a car, stereo, refrigerator—those of us without large cash reserves often find ourselves comparing costly payment plans, trying to wheedle the money out of friends, or searching endlessly for super-bargains that don't exist.

If you lack the optimism to count on the Reader's Digest Sweepstakes, or the ghoulish patience to await the demise of your rich uncle, you will have to look to other sources for the filthy stuff. You may find, after you exclude all the improbable, immoral and illegal alternatives, that you are left with the old fashioned, character-building method: *saving* the money.

Here is a program that provides helpful routines for setting up your own personal savings plan. To help explain what the program does, here's our sad-but-true tale of one young man, and how he used the routines in this program.

Jim had never been able to save much money. To encourage him, his father offered to sell him his new Porsche for only $4,000 if Jim could save the money in three years. This deal was too good to pass up, but Jim had only $500 in the bank, and his new job didn't pay much yet.

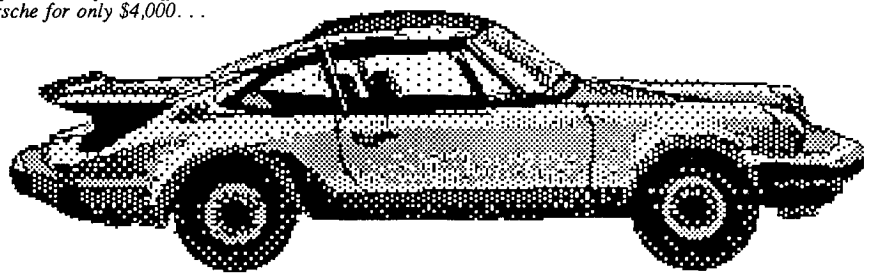
Anyone who anticipates a future expense (such as a balloon payment on a mortgage, or a trip to Hawaii next year) will see something familiar in Jim's story.

Could Jim make it? His first step was to find out what his $500 would amount to in three years. Then he could start thinking about saving the rest. For this first task, Jim selected the Compound Interest routine.

Routine 1: Compound Interest

Just as banks use a compound interest routine to figure how much interest they owe on their savings accounts, Jim used his Atari computer to project the future value of his savings in approximately 3 years.

Jim had never been able to save much money. To encourage him, his father offered to sell him his new Porsche for only $4,000. . .



When Jim ran the program, he pressed 1 to select Compound Interest from the menu. He was then prompted to enter the *present month* and then the *present year.* Because he already knew that the value of his savings account was $500, he just entered the current month and year. Had he not known the present value of his account, he could have entered the date on which he opened it and the original amount. Then the program would have computed his interest and brought his balance up to date.

Next, Jim entered his account's interest rate and number of compounding periods per year (in this case, 10% compounded 360 times per year). Both of these items required some reading of the fine print on his passbook.

The interest rate may be stated as the *effective rate* (the rate after compounding) or the *nominal rate* (the rate before compounding—a lower figure). Many institutions which offer *daily compounding* use a 360-day year. If only the effective rate of interest is known, the number of compounding periods should be set at 1.

Finally, Jim entered the *present amount* (the amount in his account as of the present date), which was $500. The program then informed him that in three years his account would be worth $674.90, noting that he would earn $174.90 in interest.

This was a big help in Jim's search for the $4000. He had *only* $3325.10 to go. Let's see how he could get it.

Routine 2: Level Payments

Because people rarely save the money *left over* at the end of each month, it is usually more effective to set aside a certain amount immediately upon receiving a paycheck. Jim needed to know how much to set aside each month in order to get his $3325.10 at the end of three years. The Level Payments routine gave him that answer.

As in the Compound Interest routine, Jim entered the present and future dates, the rate of interest, and the number of compounding periods per year. Next he was asked how many payments per year he planned to make. Because Jim was paid monthly, he entered 12. Finally, he entered the amount he would need at the end of the three year period: $3325.10.

Jim ran the program and found that he had to set aside $78.87 each payday in order to reach his goal. Jim knew he couldn't save that much each month. Was he sunk? Not yet. He could try the Increasing Payments routine.

Routine 3: Increasing Payments

The problem with level payment plans is that the payments are often too high, and they do not take into account any ability to pay a greater amount later on. The mortgage industry has responded to this situation by introducing Graduated Payment Mortgages, in which the payments rise a fixed percentage each year, as one's salary (hopefully) rises. The same technique which allows people to buy houses can be applied to other large purchases they otherwise could not afford.

Under this plan, the payments start off lower, remaining level for a year, and then rise by a set percentage for each subsequent year until the future date arrives. The initial payments are most profoundly reduced when the savings period extends over many years, as in the case of a 30-year mortgage. In such a case, the first year's payments are much lower than those of later decades.

There is a price to pay for the luxury of lower initial payments. Under the Level Payments plan, more money is saved during the early years, and this extra money goes right to work earning interest. The Level Payments plan is therefore always cheaper than the Increasing Payments plan. And yet, this should stop no one from using the Increasing Payments plan if it would help. After all, it would be cheaper still to forget about payments altogether and put away a lump sum which will grow into the amount needed. It would not be practical, however, and that is what savings plans are all about.

Let's get back to Jim. He selected the Increasing Payments plan from the menu. The program asked him the same questions it asked in the Level Payments routine, as well as by what percentage he would like his payments to rise each year.

Jim figured that his salary would rise by 5% each year, so he entered 5. To his dismay he found that his payments were only lowered to $75.30 each month. Jim shouldn't have been surprised though. After all, his payments at the end of the three-year period would be only a little more than 10% higher than they were at the beginning. In any case he needed to give his project more thought.

Routine 4: Future Value, Fixed Payments

After figuring his expenses, Jim realized that the most he could save was $50 per month. How much would that give him at the end of three years?

The Future Value, Fixed Payments routine asked Jim the same questions as the Level Payments routine, except that instead of asking him how much money he needed, he wanted to know how much he was prepared to save at the beginning of each period. Jim entered $50. He was told that his payments plus the interest would add up to $2107.86 at the end of three years. This amount, plus the future value of his savings account, was more than $1200 short.

That left Jim with two basic options. He could either negotiate a better deal with his dad, or find a way to afford more savings. So what did Jim do? He was last seen driving around in a 1973 Toyota Corolla with a wrinkled rear end. Obviously, not *everyone's* money worries can be solved by this program. But, these routines will help define problems, and thereby aid home computer users in charting a path through the financial wilderness.

CONTROL CAPSULE

Savings Planner

Key	Function
1	Compound Interest
2	Level Payments
3	Increasing Payments
4	Future Value, Fixed payments
5	End Program

Matrix Muncher

Special Atari Section

Presenting Matrix Muncher... The math-crunching utility with byte!

Note: The program *Matrix Muncher* first appeared in the March, 1983 issue of 99'er Home Computer Magazine for the TI-99/4A, and then later in Vol. 4, No. 2 of Home Computer Magazine for the C-64 and Vic 20. Here, we present an Atari version of the number-crunching *Matrix Muncher.*

Figure 1.
When you first run the program, the following screen is displayed:

```
M A T R I X   M U N C H E R

MATRIX INVERSION TECHNIQUE
TO SOLVE [A] × [X] = [B].

ENTER DEGREE OF THE MATRIX,
OR THE NUMBER OF EQUATIONS:
```

In the course of their work, engineers, scientists, technicians, and even high school students often run into math problems involving several unknowns. These unknowns are usually related, and their relationships can be expressed with mathematical equations. When these equations are solved simultaneously, the values of the unknowns are often discovered.

The pencil-and-paper method of solving simultaneous equations (usually learned in high school and soon forgotten) is time consuming and error prone. *Matrix Muncher*, a short BASIC program for the Atari 800 family of computers, can work through the solution of simultaneous equations for you. It can handle up to nine unknowns (and equations). All you have to do is produce the equations that represent the relationships among the unknowns.

A Simple Example

Let's assume that we have three equations containing three unknowns. The relations among them have been determined for us, and we want to know the values of the three unknowns. It's time for *Matrix Muncher* to go to work.

The three equations are:

$$\begin{aligned} X_1 + X_2 + X_3 &= 9 \\ 3X_1 + X_2 + 2X_3 &= 16 \\ 2X_1 + 2X_2 + 3X_3 &= 21 \end{aligned}$$

The information contained in these equations can also be expressed in matrix form as follows:

$$\begin{bmatrix} 1 & 1 & 1 \\ 3 & 1 & 2 \\ 2 & 2 & 3 \end{bmatrix} \times \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} 9 \\ 16 \\ 21 \end{bmatrix}$$

coefficients unknowns constants

In general, for n equations, the matrices can be shown as:

$$\begin{bmatrix} A_{11} & A_{12} & \cdots & A_{1n} \\ A_{21} & A_{22} & \cdots & A_{2n} \\ \vdots & \vdots & & \vdots \\ A_{n1} & A_{n2} & \cdots & A_{nn} \end{bmatrix} \times \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{bmatrix} = \begin{bmatrix} B_1 \\ B_2 \\ \vdots \\ B_n \end{bmatrix}$$

This is shown in *matrix notation* as [A] × [X] = [B]. *Matrix Muncher* uses a matrix inversion technique to solve for the unknowns.

After loading the program and typing **RUN**, you'll see the screen display shown in Figure 1.

The first piece of information that the computer requests is the degree of the matrix, or the number of equations. For our example, we enter the number 3 and press [**RETURN**].

Next, the program asks for the coefficients to be entered row by row. After we enter five of the coefficients, the screen display looks like this:

```
THE COEFFICIENTS OF X
ARE IN THE "A" MATRIX

A(1,1),A(1,2),...,A(1,N)
A(2,1),A(2.2),...,A(2,N)
A(N,1),A(N,2),...,A(N,N)

INPUT THE MATRIX VALUES
ROW BY ROW.

 A(1,1)     A(1,2)     A(1,3)
 ? 1        ? 1        ? 1
 A(2,1)     A(2,2)     A(2,3)
 ? 3        ? 1        ? 2
 A(3,1)     A(3,2)     A(3,3)
 ? 2        ? 2        ? 3
```

After we've entered all values of the coefficients, *Matrix Muncher* requests the values of the constants (Bx).

```
NOW INPUT ELEMENTS OF B

B(1)
? 9
B(2)
? 16
B(3)
? 21
```

When the last value of the B matrix has been entered, the Magic Math Machine goes to work:

```
M U N C H
M U N C H
M U N C H

SOLUTION VALUES ARE:
X(1)=2
X(2)=4
X(3)=3
```

Each major step completed in the program causes the word MUNCH to scroll on the screen. After the unknowns have been found (or *Matrix Muncher* discovers that no unique solution exists), the results are displayed in the format above.

Go ahead— see if they work!

An Applesoft INSTRING Function

When writing a BASIC program, it is often important to know when one character or string of characters occurs in another string. You can use a **FOR-NEXT** loop in conjunction with the **MID$( )** function to discover this information, but if many strings must be searched, or the string being searched is very long, this method can be very slow.

Unfortunately, this is the only viable method available in Applesoft BASIC. Other BASIC languages, like Microsoft BASIC and TI BASIC, have special functions dedicated to this type of string search. By using a modified version of the Applesoft **USR( )** function, we've created a machine-language routine to add this useful function to your BASIC programs. The 2 files on your HCJ disk that relate to this routine are INSTRING and INSTRING.DEMO. INSTRING is the binary file that contains the code itself, and although it is assembled to run at memory location 768 ($300), the code is completely relocatable.

INSTRING.DEMO (shown in Listing 1) is a BASIC program that **BLOAD**s INSTRING, and then sets up the **USR( )** function to call this routine by **POKE**ing zero-page memory locations 11 ($B) and 12 ($C) with 0 and 3 respectively. These locations contain the address (low byte in 11 and high byte in 12) of the routine called by the **USR( )** function—in this case 768 or $0300.

The program then prompts the user for 2 strings and a starting location within the second string where the search is to begin. In line 240 the **USR( )** function is called using the input data in the following format:

```
240 Y = USR(X),A$,B$
```

A$** is the string to be searched for, **B$ is the string to be searched, and **X** is the position in **B$** where the search is to begin (position 1 being the first character). **Y** will then be be set equal to to the starting position where the string is found or be set to zero if it is not found. For example, let's say we input **by** as our string to be searched for (**A$**), **step-by-step & inch-by-inch** as the string to be searched (**B$**), and **1** as the start location (**X**). After line 240 executes, **Y** is set to **6** because **by** begins at the sixth character in **B$**. To show that the routine has found the string, line 260 prints **B$** to the screen with the first occurrence of **A$** printed in inverse. If **A$** is not found in **B$** *at or after* the starting location **X**, then the computer beeps twice and displays the message **STRING NOT FOUND**.

This relatively simple example program does not by any means demonstrate the real power of this routine. A slightly enhanced version of this routine was used in *FormFlex* in Volume 2 of HCJ, and it greatly increased the speed of a number of functions in that program.

Tips On Using INSTRING

Generally, this routine is easy to install and use in your programs. Just follow the guide of the INSTRING.DEMO program. Because of the difference between the way Applesoft stores string variables, such as **A$**, and the way it stores string literals (an actual quoted string), however, you should not use string literals directly in the command. For example, if you wish to search for the string **Hello**, don't use it directly in the **USR( )** statement. You should first assign it to a variable, then use the variable with the **USR( )** command.

Do it this way	*NOT this way*
`A$="Hello":Y=USR(1),A$,B$`	`Y=USR(1),"Hello",B$`

If you do use the string literal approach, the program may work once, but it could bomb the computer the second time you call the routine. This is true of both the string being searched, and the string being searched for. On the other hand, the numeric quantity in parentheses after the **USR( )** command can be either a literal numeric quantity or a variable.

Listing 1

```
100  REM  ****************
110  REM  * INSTRING DEMO *
120  REM  ****************
130  REM  COPYRIGHT 1987
140  REM  HOME COMPUTING JOURNAL
150  REM  VERSION 3.0
160  REM  APPLE II FAMILY APPLESOFT
170  PRINT  CHR$ (4);"BLOAD /HCJOURNAL3/INSTRING
180  HOME : POKE 11,0: POKE 12,3
190  PRINT "INPUT SEARCH STRING: ": INPUT A$
200  IF A$ = "" THEN END
210  PRINT "INPUT STRING TO BE SEARCHED: ": INPUT B$
220  IF B$ = "" THEN END
230  PRINT "START LOCATION: ": INPUT X
240  Y =  USR (X),A$,B$
250  IF Y = 0 THEN  INVERSE : PRINT  CHR$ (7);
CHR$ (7);"STRING NOT FOUND": NORMAL : GOTO 190
260  PRINT  MID$ (B$,1,Y - 1);: INVERSE : PRINT A$;
: NORMAL : PRINT  MID$ (B$,Y +  LEN(A$))
270  GOTO 190
```

An Atari INSTRING$ Function

The ability to search a string for a particular character or sequence of characters is very useful. IBM's BASICA and TI BASIC have this function built in. Unfortunately, Atari BASIC does not. During development of our Atari programs, we found this function a necessity. Finding BASIC too slow, we wrote a string-search routine in machine language. The resulting routine, INSTRING$, is presented here.

On your HCJ Volume 3 disk is the program file INSTRING. This is a BASIC program that illustrates how to use our INSTRING$ function.

When the INSTRING program is run, your are asked to enter the search string. This is the string that you are searching for. Next, you are asked to enter the string to be searched. After entering this last string, the program calls our routine and displays the result. If the string is found, the location of the found string is highlighted. If the string is not found, the message "STRING NOT FOUND" is displayed. The program repeats until a null string is entered for either the search string or string to be searched. See Figures 1 and 2 for the line number and program variable explanations.

Whenever you write a machine-language program, you must consider where in memory you are going to store your code. We chose to store our routine in a BASIC string variable—the ATASCII values of the characters in the string make up the actual machine-language instructions. When using this method, you must write relocatable machine code because BASIC decides where in memory the code (string variable) is actually stored. In line 200 of INSTRING we both **DIM** the variable **INSTR$** and store our code in it. To use this routine, simply extract this line and drop it into your own program.

Here is the proper syntax for using the INSTRING$ routine:

```
X=USR(ADR(INSTR$),ADR(B$),ADR(A$),LEN(B$),LEN(A$))
```

A$** is the search string, **B$ is the string to be searched, and **X** returns the position of **A$** in **B$**. If **X** returns a zero, then the string was not found. This routine can only handle strings of 255 characters maximum in length.

This very routine was used in the program *FormFlex* from HCJ Volume 2. It helped to speed up several important program functions.

Figure 1

INSTRING Line Number Explanations

Line Nos.	Explanation
100-180	Program header
190	Dimension search strings
200	Set up machine-language routine
210	Input search string
220	Input string to be searched
230	Call INSTRING routine
240	Check if string is found
250-280	Print highlighted string
290	Re-enter program

Figure 2

INSTRING Variable Explanations

Variable	Function
INSTR$	String variable that stores machine code
A$	Search string
B$	String to be searched
Y	Position of search string
I	Loop counter

Title Maker

Title Maker is a machine-language routine that prints characters four times their normal size. It can print in reverse and color at machine-language speed and is simple to use.

Title Maker is provided on your HCJ Volume 3 disk as a BASIC loader under the file name TITLE MAKER. When run, the BASIC loader stores the machine-language routine in memory starting at 49152 ($C000). Before entering any of the following examples, you must install *Title Maker* by running its BASIC loader.

Using this routine is very much like using a **PRINT** statement. Simply type "**SYS 49152,**" followed by the item, or items, that you wish to print. For example, to print the brand name of your computer in large letters, you would enter the following:

```
SYS 49152,"COMMODORE"
```

Numbers can be printed just as easily. For example, the following prints the answer to a mathmatical problem:

```
SYS 49152,"2 + 2 =";2 + 2
```

You must use a comma to separate the **SYS** command and the items being printed, or you will get a syntax error. As with **PRINT**, a semicolon following the command suppresses a carriage return, or it can be left off to produce one. Because this routine increases a character's size four times, a carriage return moves the cursor down four lines instead of one. Special control characters, such as [CRSR UP] or [CTRL] 6, can be printed by *Title Maker* and often produce impressive results.

Title Maker can't, however, use the **TAB** and **SPC** functions. Using commas outside of a string for the use of advancing the cursor should also be avoided.

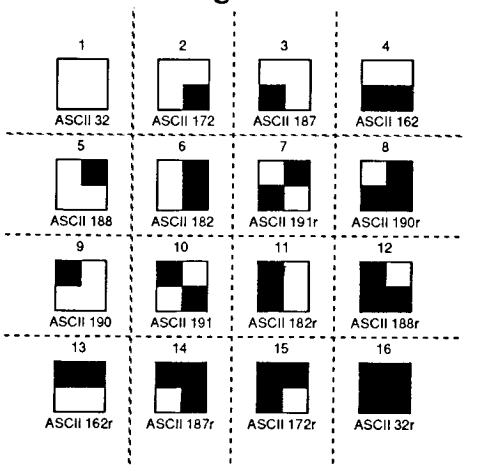
There are two sample programs on your HCJ Volume 3 disk that show off some of *Title Maker's* various uses. The first one, *Time Piece*, simply turns your computer into a digital clock—a very expensive one at that. The second program, entitled *Flap Attack*, is an arcade game in which large hostile birds (inspired by Hitchcock) are attacking society and must be shot down from the sky. Ten points are awarded for each bird hit and 100 points wins the game. The score, the cannon, and the flying invaders are all created by using enlarged characters. For you programmers out there, simply add lines 10000-10430 of *Title Maker's* BASIC loader to your programs and enlarged characters are at your disposal. You must initialize *Title Maker* by executing a **GOSUB 10000** prior to printing enlarged characters.

Without the Commodore 64's extensive number of graphics characters, *Title Maker* would not have been possible. To produce enlarged characters, this program uses graphics characters, instead of pixels, to draw a character's shape. The bit pattern of each character printed is retrieved from Character ROM. Next, the bit pattern is evaluated until each 2-by-2 block of pixels in the character's shape is reduced to a single graphics character. Any 2-by-2 block can be represented by one of sixteen graphics characters.

To speed up this pixel-to-character conversion, *Title Maker* uses a look-up table consisting of the 16 possible characters. Now, each 2-by-2 pixel pattern is converted into a number and used as an index to retrieve and print the corresponding graphics character. Figure 1 shows the sixteen possible graphics characters used and the order in which they appear in the program's conversion table.

For those of you interested in the detailed inner workings of this program, we've provided the fully documented source code for *Title Maker* on your HCJ Volume 3 disk under the file name TMAKER.S. This file was assembled using Commodore's Macro Assembler Development System.

Figure 1



These 16 graphics characters can represent any 2-by-2 bit pattern. Below each character is the character's Commodore ASCII value. (ASCII values followed by the letter "r" are displayed in reverse video.) Above each character is the character's numeric location in the pixel-to-character conversion table.

Popular PEEKs 'n' POKEs

An important addition to any IBM PC programmer's notebook is a list of useful **PEEK**s and **POKE**s. The BASIC commands **PEEK** and **POKE** allow you to read a byte from memory and write a byte to memory. With these commands, you can access normally inaccessable computer functions.

Both **PEEK** and **POKE** require a numeric parameter between 0 and 65535 (Hex 0000 to FFFF), specifying the memory address to be read or written to. This address parameter is used as an offset into the current 64K data segment. The **DEF SEG** statement allows you to set the data segment anywhere within the computer's memory. All of the following examples make use of the **DEF SEG** statement. Refer to the IBM Tech Note in HCJ Volume 2 for further information on **DEF SEG**.

Below are just of few **PEEK**s and **POKE**s that you should find useful. All of these **PEEK**s and **POKE**s should be followed by the lone command **DEF SEG**, in order to reset the data segment to BASIC's default. These examples may not work on some PC clones.

The **POKE** command is a very powerful tool for those who wish to use it. When using the **POKE**s given above, make sure that you enter them correctly. Although you can never damage your computer with a **POKE**, you can "crash" the system, forcing you to re-boot your system in order to regain control.

Keyboard

PEEK/POKE	Function
DEF SEG=&H40:STAT=PEEK(&H17) AND &H80	Check insert status
DEF SEG=&H40:STAT=PEEK(&H17) AND &H40	Check caps-lock status
DEF SEG=&H40:STAT=PEEK(&H17) AND &H20	Check num-lock status

If the variable **STAT** returns a non-zero value, the corresponding status is active.

DEF SEG=&H40:POKE &H17,PEEK(&H17) OR &H80	Activate insert mode
DEF SEG=&H40:POKE &H17,PEEK(&H17) AND &H7F	De-activate insert mode
DEF SEG=&H40:POKE &H17,PEEK(&H17) OR &H40	Activate caps-lock mode
DEF SEG=&H40:POKE &H17,PEEK(&H17) AND &HBF	De-activate caps-lock mode
DEF SEG=&H40:POKE &H17,PEEK(&H17) OR &H20	Activate num-lock mode
DEF SEG=&H40:POKE &H17,PEEK(&H17) AND &HDF	De-activate num-lock mode
DEF SEG=&H40:POKE &H17,PEEK(&H17) OR &H10	Activate scroll-lock mode
DEF SEG=&H40:POKE &H17,PEEK(&H17) AND &HEF	De-activate scroll-lock mode
DEF SEG=&H40:POKE &H1A,PEEK(&H1C)	Clear keyboard buffer

Screen

PEEK/POKE	Function
DEF SEG=&H0:STAT=PEEK(&H10) AND &H30	Check monochrome mode

If **STAT** returns a non-zero value, the computer is in monochrome mode.

DEF SEG=&H40: COL=PEEK(&4A)+256*PEEK(4B)	Get number of columns

Miscellaneous

PEEK/POKE	Function
DEF SEG=&H50:DS=PEEK(&H10)+256*PEEK(&H11)	Get BASIC's data segment
DEF SEG=&H0:POKE 108,64:POKE 109,1: POKE 110,112:POKE 111,0	Disable [BREAK] key
DEF SEG=&H0:POKE 64,0	Bomb the computer

ACCEPT AT (New & Improved)

If you were to make a list of Extended BASIC's top ten commands, chances are that **ACCEPT** would be included. This command provides a safe-yet-convenient means of receiving input. The TI Extended BASIC manual explains this command's capabilities best: "Many options are available with **ACCEPT**, making it far more versatile than **INPUT**. It may accept data at any screen position, make an audible tone (beep) when ready to accept the data, erase all characters on the screen before accepting data, limit data accepted to a certain number of characters, and limit the type of characters accepted."

So, what's better than the **ACCEPT** command? Our new-and-improved **ACCEPT** command, of course. This new version is provided on your HCJ Volume 3 disk under the file name ACCEPT_O. It is an assembly-language object file that is loaded by the following commands: `CALL INIT :: CALL LOAD("DSK1.ACCEPT_O")`

For this code to function properly, you must have a disk in drive 1 that contains the ACCEPT_O file. You must also have TI Extended BASIC and the 32K Memory Expansion.

Before we explain why this new **ACCEPT** command is better, let's discuss the limitations found in the standard **ACCEPT** command. First off, you can only input *one* screen line of text when using **ACCEPT AT**. This is probably the **ACCEPT** command's biggest limitation. (Note: It is possible to use the **ACCEPT** command without the **AT** option and receive up to 255 characters, but the input prompt will appear at the bottom of the screen, causing the screen to scroll when more than 27 characters are entered.)

Next, there are only three keypresses that will exit an **ACCEPT** command—[ENTER], [FCTN] E, and [FCTN] X. What if you want to provide the user with a [FCTN] 9 escape option, or allow them to move from one input field to another through the use of [CTRL] key combinations? With Extended BASIC's **ACCEPT**, you can't. You are stuck with the three keypresses listed above, and no direct way to tell which of the three keypresses was used to terminate input.

This is where our new **ACCEPT** command comes in. Our version of the **ACCEPT** command accepts up to 255 characters *anywhere* on the screen. You can also define up to 15 exit keys and the key that is used to exit the **ACCEPT** command is returned in the string variable of your choice. The format of our **ACCEPT** command is shown in Figure 1.

There are some things that you must take into account when using our new **ACCEPT** command. First, to create a cursor, this program makes special use of the sprite definition table. Consequently, you cannot have any sprites on the screen during execution of the new **ACCEPT** command. If there are any sprites active when you call the new **ACCEPT** command, they will be turned off, just as if you had issued the command **CALL DELSPRITE(ALL)**. You can always re-activate your sprites after using the new **ACCEPT** command by calling them up again with the **CALL SPRITE( )** command.

Because the input cursor is a sprite, it can have a different color than any of the characters. In fact, the cursor should always be a different color than any of the characters, or you will not be able to see the character that the cursor is currently on top of. To specify the color of the cursor, use the following command: `CALL COLOR (#1,COLOR)`

The **COLOR** parameter must be a number between 1 and 16, corresponding to the color of your choice (see Figure 2). This command should precede any calls to the new **ACCEPT** command. If you do not set the cursor's color prior to using the new **ACCEPT** command, the cursor will probably default to color #1 (transparent). When selecting a color, try to choose one that contrasts well with color of the characters and the screen.

Being able to change the cursor's color can come in handy. With this ability, you can color-code your input fields. For example, you can have the cursor turn blue when prompting for numeric data, and red when prompting for letters.

Refer to this Volume's feature program *Crossword Composer* for an example of how to use this new command from within a program. This program uses the new **ACCEPT** command to input the crossword puzzle's words and clues.

Figure 1

```
CALL LINK("ACCEPT",ROW,COLUMN,SIZE,VALIDATE$,EXIT$,ESC$,S$)
```

Parameters:

ROW,COLUMN (numeric) designates the starting position on the screen for input. The **ROW** can be between 1 and 24 while the **COLUMN** can be between 1 and 28.

SIZE (numeric) defines the maximum number of characters that can be entered. This parameter can vary between 1 and 255.

VALIDATE$ (string) defines the characters that can be entered during input. If this string is null, all characters are considered legal.

EXIT$ (string) contains the various keypresses that can be used to terminate input (up to 15 characters). If this string is null, only the [ENTER] key will terminate input.

ESC$ (string) returns the ASCII of the key used to exit the **ACCEPT** command (see previous parameter).

S$ (string) returns the input data.

Notes: This **ACCEPT** command does not clear the input area of the screen, and any characters that are located in the input area become the default input. Also, there are two options found in the standard **ACCEPT** command that are not implemented in our new version: Our new version cannot **BEEP** or **ERASE ALL**. If you must make noise or clear the screen prior to input, then you can always use the **CALL SOUND** and/or **CALL CLEAR** commands first.

Figure 2

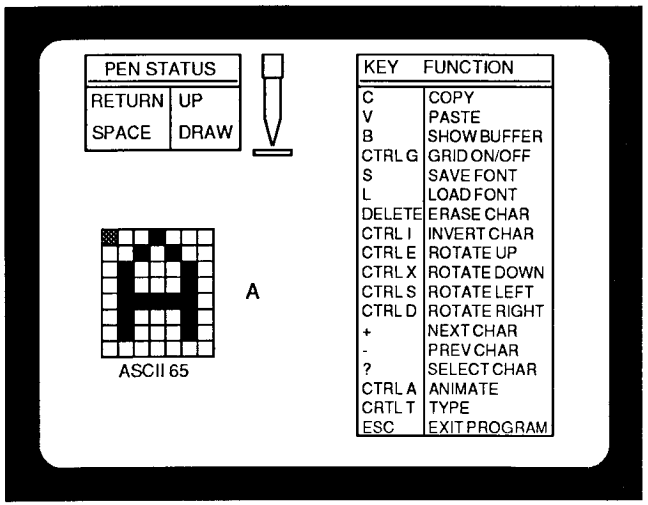
Code	Color
1	Transparent
2	Black
3	Medium Green
4	Light Green
5	Dark Blue
6	Light Blue
7	Dark Red
8	Cyan
9	Medium Red
10	Light Red
11	Dark Yellow
12	Light Yellow
13	Dark Green
14	Magenta
15	Gray
16	White

Apple Character Editor

Adding character to your BASIC programs.

In HCJ Volume 2 we published the program *Hi-Res Text* for displaying characters on the Apple's high resolution (hi-res) screen. The *Hi-Res Text* program uses our own form of shape tables to generate the characters' shapes. With the use of the following program, *Apple Character Editor*, you can make your own character shape tables and create custom characters. Each character set that you design can be saved to disk and used in your own programs.

Apple Character Editor is provided on your HCJ Volume 3 disk under the file name CHAREDIT. This is a BASIC program. When you run this program, you must make sure that the file HIRESTEXT.BIN, also provided on your HCJ Volume 3 disk, is on the disk in the current drive.



Using The Character Editor

When you run *Apple Character Editor*, you are presented with the editing screen (see the accompanying screen simulation). All program options are accessed via a keypress from this screen.

In the middle-left part of the screen is your design pad. The design pad is a 7 X 8 grid, representing an enlarged character. Inside the design pad is your cursor, flashing away; use your computer's cursor keys to move it. You'll be using the cursor to design characters (more on this later).

Directly below the design pad is the ASCII value of the character that you are currently editing. To the right of the design pad is the actual character. Whenever you modify something in the design pad, the character on the right is updated.

Above the design pad is the pen status. The pen status determines how your cursor affects the character being edited in the design pad. The pen can be set to Draw or Erase; it can also be Up or Down. If the pen is Up, moving the cursor has no effect on the character being edited. When the pen is Down, moving the cursor either draws or erases pixels (depending on whether the pen is set to Draw or Erase).

On the right, is an on-screen Control Capsule. All of *Apple Character Editor's* keypresses are documented here. A Control Capsule also appears on the following page.

Although most of *Apple Character Editor's* functions are self-explanatory, some require further instruction.

First, moving to the previous or next character is accomplished easily by pressing the – or + keys. To jump to a selected character, you must press ?. Now, to select a character, press the key that corresponds to the character that you wish to edit. (To move to ASCII 65, for example, press the A key.)

Apple Character Editor's most interesting feature is its Animate function. Animation is generally the result of several similar, but different pictures being displayed in rapid succession. This is essentially the basis behind *Apple Character Editor's* Animate function—only instead of pictures, we display characters.

When you activate the Animate function by pressing [CTRL] A, you are prompted for a starting character and an ending character. To enter these characters, use the same method described above for selecting an edit character. Once selected, the Animate routine repeatedly cycles between the starting and ending characters. To speed up this sequence, press the cursor-up key. Conversely, the cursor-down key slows down the sequence. Pressing [ESC] exits Animate mode.

For the duplication of character shapes, we offer the Copy and Paste options. When you select Copy by pressing **C**, the shape of the current character is placed into a buffer. The buffer contents can be displayed by pressing **B**. Now, whenever you select Paste by pressing **V**, the current character's shape is replaced by the character in the buffer. Duplicating a character's shape comes in very handy when creating animated sequences.

You can test drive a character set by pressing [CTRL] T. This gives you the chance to see what your characters look like next to each other. This mode allows you to type two screen lines of text onto the screen. The [DELETE] and cursor-left keys are your only editing tool. To escape this mode, press [ESC].

You may also load and save your character sets. A character set comprises all 96 ASCII characters. When you choose one of these options, the computer prompts you for a file name and then saves or loads your file. Character set files are saved with the four character extender .FNT.

Building Character

No one likes the "blank-paper blues," so to get you started with some pre-built characters, we have provided two character set files on your HCJ Volume 3 disk. The names of these files are listed below:

Font Name	Description
STANDARD	The standard Apple II font
FATFONT	A well-fed font

To load one of these character sets, select the Load Font option, insert your HCJ disk, and enter one of the above file names. When you first run *Apple Character Editor*, you are supplied with the STANDARD font to experiment with.

Adding Character To Your Programs

We provide two examples of using custom characters in a program on your HCJ Volume 3 disk. These examples are the *Apple Character Editor* program itself, and *Fontpad*, an improved version of the *Notepad* program originally presented in HCJ Volume 2. We will explain how to use *Fontpad* later on.

Using a custom character set in one of your own programs is really very easy. First, because you can only display these characters on the hi-res screen, you must use the *Hi-Res Text* program supplied on your HCJ Volume 3 disk. This is a binary file saved as HIRESTEXT.BIN. (To understand how to use this program, refer to the Apple Focus in HCJ Volume 2.) To see how to load this machine-language file, refer to lines 190-220 of *Fontpad* or lines 200-230 of *Apple Character Editor*.

Now, to load one of your own character sets, simply **BLOAD** it into memory. This must be done *after* you have loaded HIRESTEXT.BIN. You see, the font files are loaded directly on top of the character shape tables used by the *Hi-Res Text* program. For an example, see lines 760-810 of *Fontpad* or lines 1880-1980 of *Apple Character Editor*. When loading character sets, remember the four character extension .FNT added to all character sets created by *Apple Character Editor*.

Using Fontpad

To use *Fontpad*, simply enter **RUN FONTPAD** or select the program from the *HCJ Director*. This sample program simulates a real notepad for you to write, print, and save notes. This program was inspired by the Notepad desk accessory available on the Apple Macintosh.

The notepad has 8 pages. To move from one page to another, hold down the **[OPEN APPLE]** key and press any number **1** through **8** (corresponding to the page that you wish to turn to). To enter text on the notepad, you simply type it in. To edit your typing, you can backspace with the **[DELETE]** or cursor-left key and correct your mistakes. If you wish to erase the entire page, press **[OPEN APPLE] C**. To print the page, press **[OPEN APPLE] P**. The [ESC] key exits the program.

When *Fontpad* is first run, it attempts to load the text file NOTEPAD.TXT. If this file is not present, the notepad comes up blank. Whenever you exit *Fontpad*, the program attempts to create the file NOTEPAD.TXT. If a non–write-protected disk is in the drive, your notepad will be preserved for later editing. You can have one notepad per disk. Just remember to copy the files HIRESTEXT and FONTPAD onto every disk that you want your notepad on.

The big change between *Fontpad* and the original *Notepad* program is fonts. *Fontpad* allows you to work in any font created by the *Apple Character Editor* program. To select a font while *Fontpad* is running, press **[OPEN APPLE] F**. The computer will prompt you for the name of the font that you wish to use, and then load it into memory. You may use any of the two fonts supplied on your HCJ Volume 3 disk. Whenever you change the font, it changes all characters in the notepad, not just subsequently typed characters.

CONTROL CAPSULE

Fontpad

KEY	FUNCTION
DELETE	Backspace over text
Cursor left	Backspace over text
[OPEN APPLE] 1 through 8	Turn to selected page
[OPEN APPLE] P	Print page
[OPEN APPLE] C	Clear page
[OPEN APPLE] F	Load a font
ESC	Exit program

CONTROL CAPSULE

Apple Character Editor

KEY	FUNCTION
Cursor keys	Move cursor
RETURN	Pen Up/Down
SPACE	Pen Draw/Erase
C	Copy character
V	Paste character
B	Show buffer
CTRL G	Grid on/off
S	Save font
L	Load font
DELETE	Erase character
CTRL I	Invert character
CTRL E	Shift character up
CTRL X	Shift character down
CTRL S	Shift character left
CTRL D	Shift character right
+	Next character
-	Previous character
?	Select character to go to
CTRL A	Animate character
CTRL T	Type characters
ESC	Exit program

HCJ Duplicator

Duplicate entire disks with one or two drives.

As any computerist will tell you, it is very important to backup your disks periodically. You never can tell when a disk is going to kick the old bit bucket, visit the big disk drive in the sky, or go south without informing you of its travel plans. Whether you are programming or word processing, neglecting to backup a disk can mean hours of lost work.

If you own a 1541 disk drive, then you own the VIC-1541 TEST/DEMO disk. Included on this disk is the COPY/ALL program. Although this program does a good job of backing up PRoGram and SEQuential files, it requires two disk drives and does not duplicate RELative files and certain USeR files. Owners of the 1571 disk drive are luckier—they receive the SD.BACKUP.C64 program for backing up disks. This program requires only one drive and successfully copies relative files. The SD.BACKUP.C64 program, however, only works with *one* drive. Owners of two-drive systems are forced to swap disks during the copy process. The program presented here, *HCJ Duplicator,* was designed to "fill the gap" left by single-drive copiers and non-relative file copiers. *HCJ Duplicator* is a user-friendly disk copier that duplicates entire disks—relative files and all—using one or two drives.

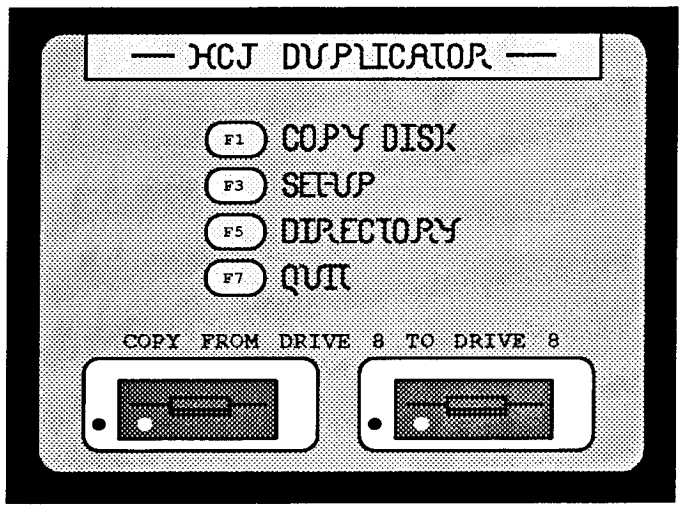


Figure 1

Track Numbers	Sector Numbers	Sectors Per Track	Bytes Per Track
1 to 17	0 to 20	21	5376
18 to 24	0 to 18	19	4864
25 to 30	0 to 17	18	4608
31 to 35	0 to 16	17	4352

A disk has a total of 683 blocks (a block is one sector on one track), each of which hold 256 bytes of information. This works out to be a total of 174,848 bytes on one disk.

Program Options

To run *HCJ Duplicator,* insert your HCJ Volume 3 disk and enter **LOAD "DUPLICATOR",8,1** or select the program using the HCJ Director. If you forget the trailing **1** in the above command, simply enter **RUN** after the program has loaded.

This program offers these 4 options:

```
f1      Copy Disk
f3      Set-Up
f5      Directory
f7      Quit
```

The Copy Disk option (f1) initiates the disk duplication process. Depending on the Set-Up (f3), the disk copy can be done 4 different ways. These four possible Set-Ups are listed below:

```
Copy from drive 8 to drive 8
Copy from drive 8 to drive 9
Copy from drive 9 to drive 9
Copy from drive 9 to drive 8
```

Note that the drive numbers shown above correspond to the drive's device number. The current Set-Up is always displayed near the bottom of the screen, above the drawing of the two disk drives. The default Set-Up is to copy from drive 8 to drive 8—a standard one-drive copy. By pressing **f3** you can cycle through the possible Set-Ups until you find the one you want.

It's very useful to be able to view a disk's directory prior to copying a disk. Just press **f5**, and the directory of the disk that is in the drive that you are copying from lists to the screen. If, for example, you wish to list the directory of the disk in drive 9, and you are copying from drive 8, you can change the Set-Up or manually transfer the disk in drive 9 to drive 8 prior to pressing **f5**. While the directory is listing, you can freeze the output by pressing the **[SPACE]** bar. Pressing any key will start the directory listing again. Once the directory is done listing, press any key to return to the main screen.

Pressing **f7** exits the program and returns you to BASIC. To re-run the program, you must re-load it using the instructions given above.

Duplicating A Disk

Once you have chosen the Set-Up that you want, you are ready to copy a disk. Before pressing f1, however, it is a good idea to cover the write-protect notch on the disk that you are copying. This prevents any mishaps that may occur if you accidentally insert the source disk (the disk that you are copying) when the computer is expecting the destination disk (the disk that you are copying to).

Copying a disk with a single drive requires 4 disk swaps (you must swap the source disk with the destination disk 4 times). Whenever it is time to insert either the source or destination disk, the computer prompts you to do so and produces an audible bell sound until you insert the disk and press a key. So, while the computer is copying, you can leave the room and return to swap disks upon hearing the bell.

If you are duplicating a disk with two drives, you do not have to do any disk swapping. All you must do is insert both the source and destination disks, and then let the computer do

the rest. In both single-drive copies and two-drive copies, destination disks do not need to be formatted before duplication—the program does this for you.

At any of the disk-insertion prompts, you may press the back-arrow key to abort disk duplication. This comes in handy if you ever press f1 by mistake. It is not, however, a good idea to abort the duplication process in the middle of a disk copy. What good is a half-duped disk anyway?

While duplicating, the computer informs you of the track and sector that it is currently reading or writing. A 1541 disk consists of 35 tracks and a track has an average of 18 sectors (see Figure 1). The *HCJ Duplicator* program copies every track and sector found on a disk, regardless of the number of files and used blocks. This ensures a *true* disk duplication. This program is not a file copier, it is a disk-backup program. In other words, this program duplicates an entire disk as opposed to just selected files.

This program takes approximately 20 minutes to copy a disk. And on single drive copies, it will always take 4 disk swaps to complete the duplication. Admittedly, this program does not break any of the speed records set by expensive disk-duplication programs, but it sure out-runs the old COPY/ALL program which can take over 30 minutes to copy a full disk. If the computer encounters a disk error, the error is printed to the screen accompanied by an ominous sound, and the duplication process is aborted. Because of this, *HCJ Duplicator* will not duplicate copy-protected software—that is not the intent of this program. But, by duplicating every track and sector found on a disk, this program does backup certain types of "friendly" copy-protected disks.

A good way to break-in this program would be to duplicate your HCJ Volume 3 disk and place the original disk in a safe place; it is always a good idea to backup valuable software.

The Nuts And Bolts

HCJ Duplicator is pure machine code, so trying to list the program with BASIC is useless. It's written in machine language to ensure maximum speed and minimum memory consumption. By reducing the program's size, we can secure a large data buffer for transferring disk information, thus reducing the number of disk swaps required in a single-drive copy.

To read and write each block of information on a disk, *HCJ Duplicator* makes use of the 1541's user commands **U1** and **U2**. The **U1** command reads a specified track and sector while **U2** writes to a specified track and sector. These commands are used in place of the traditional **B-R** and **B-W** commands, because **B-R** and **B-W** do not work properly. **B-R** rarely reads the proper number of bytes. Instead, **B-R** reads the number of bytes that correspond to the current track number. In other words, if you are reading from track 10, you can only reliably read 10 bytes!

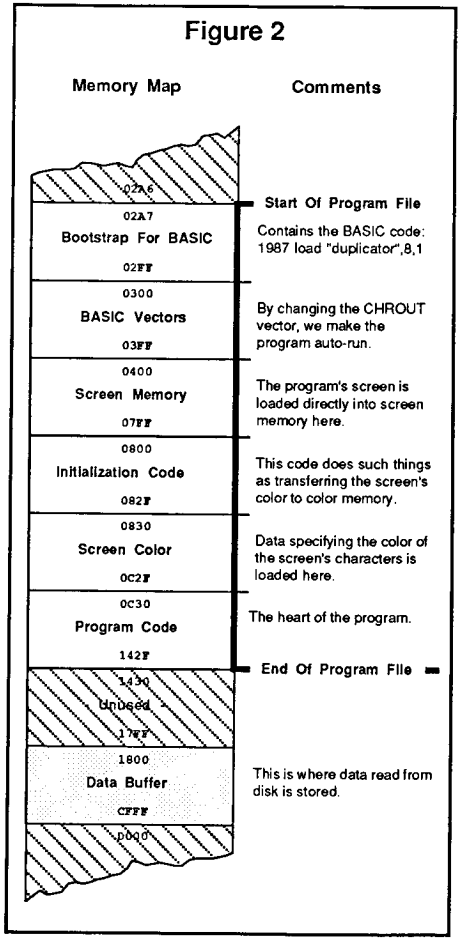
As for **B-W**, this command destroys information by recording the number of bytes written to a block as the first byte of data in the block. The first byte in a block is generally a very important link to following blocks of data—something you don't want to lose. For more information on the 1541's features and drawbacks, there are three excellent books on the subject: *Inside Commodore DOS*, from DATAMOST, *The Anatomy of the 1541 Disk Drive*, from Abacus and, believe it or not, the *1541 User's Manual*, from Commodore Business Machines.

One thing that makes *HCJ Duplicator* somewhat unique is its auto-run feature. The auto-run is accomplished by loading the first part of *HCJ Duplicator* on top of the Commodore 64's BASIC vector table located in page three ($0300-$03FF). During the load, the vector that points to the character output routine (CHROUT) is changed to point to *HCJ Duplicator's* entry point. Now, when the load is complete and BASIC goes to print its familiar "READY." prompt, it runs our program instead. Before *HCJ Duplicator* exits to BASIC, the CHROUT vector is restored to its normal value.

Because *HCJ Duplicator* loads into memory starting at $02A7, the program's data eventually loads over into screen memory located at $0400-$07FF. So, to draw the program's main screen, all we did was load the main screen directly into screen memory. It isn't until the program is run that we provide color to the screen by transferring the color data into color memory located at $D800-$DBFF.

The actual program code is located in the BASIC workspace starting at $0800. A complete memory map of *HCJ Duplicator* is shown in Figure 2. All numbers in this figure are represented in hexadecimal.

Figure 2



Expanded DOS

Add four valuable DOS commands to your IBM PC or PC compatible.

Through the use of COM and EXE files, it is possible to add commands to your computer's disk operating system (DOS). In fact, many standard DOS commands, such as **FORMAT** and **MODE**, are actual COM or EXE files found on your DOS disk. (These type of DOS commands are called External because they are not internal to the operating system itself, but stored on disk.) Using assembly language, or one of many compiled languages, programmers can create their own DOS commands. Here, we present four such commands created by our programmers. These four commands provide file manipulation capabilities not available with standard MS-DOS.

The added commands appear on your HCJ Volume 3 disk under the file names CFD.COM, HIDE.COM, SHOW.COM, and REVEAL.COM. To use these commands, copy these files onto your DOS work disk. To issue a command, just type its name (with or without the COM extension). The disk containing these commands must be in the active disk drive in order for a command to work. For convenience sake, you may want to copy these files onto all of your most-used work disks.

The commands presented here offer some useful file tools. How many files do you have dated 1-1-80, simply because you neglected to set the system date? With **CFD** (Change File Date), incorrect dates can be corrected. **CFD** helps you keep files truly up to date.

Did you know that IBM DOS has a built in function to hide files? Hidden files cannot be deleted, renamed, copied, written to, read from, or even listed. IBM uses this function to hide the two system files IBMBIO.COM and IBMDOS.COM on disks formatted with the /S option. Previously, hidden files were completely non-accessable. With our commands **HIDE**, **SHOW**, and **REVEAL**, hidden files can now be created, un-hidden, and even listed.

Beside hidden files, there are also system files. A file may be a hidden file and a system file at the same time (IBMBIO.COM and IBMDOS.COM are two such examples). DOS handles system files identically to hidden files. (In future versions of DOS, this may change.) Besides providing access to hidden files alone, the commands **HIDE**, **SHOW**, and **REVEAL** can optionally operate on system files as well.

The pages shown here provide documentation for our Expanded DOS. You may want to cut out, punch, and place these pages into your DOS manual for future reference. The dotted lines act as a guide for cutting out each page, and the circles designate where binder-ring holes should be punched.

CFD (Change File Date) Command

Purpose: Changes the recorded date of a file in the directory.

Format: CFD [*d:*][*path*][*filename*][*.ext*] [*mm-dd-yy*] [*hh:mm:ss.xx*]

Type: Internal External
***

Remarks: If any of the command parameters are omitted, the computer will prompt you for them. The file name can contain global file name characters, so it is possible to change the date of more than one file with a single command.

If the date parameter contains a valid date, then the new date is accepted as the file's date. Otherwise, the computer displays the following prompt:

```
Current date is mm-dd-yy
Enter new date: _
```

Enter a new date in the form mm-dd-yy where:

mm is a one or two-digit number from 1-12
dd is a one or two-digit number from 1-31
yy is a two-digit number from 80-99
(a leading 19 is assumed) or a four-digit number from 1980-2099

The file's current date is displayed as the current date. To leave the date as is, press enter at the above prompt.

If the time parameter contains a valid time, then the new time is accepted as the the file's time. Otherwise, the computer displays the following prompt:

```
Current time is hh:mm:ss.xx
Enter new time: _
```

Enter a new time in the form hh:mm:ss.xx where:

hh is a one or two-digit number from 0-23 (representing hours)
mm is a one or two-digit number from 0-59 (representing minutes)
ss is a one or two-digit number from 0-59 (representing seconds)
xx is a one or two-digit number from 0-99 (representing hundreths of a second)

The file's current time is displayed as the current time. To leave the time as is, press enter at the above prompt.

Example: This example changes the date and time of the file MYFILE.TXT.

```
CFD MYMILE.TXT 4-9-87 10:54
```

HIDE
Command

Expanded DOS © Home Computing Journal 1987

Purpose: Marks a file as hidden so that it is not listed in normal directory searches.

Format: HIDE [*d:*][*path*][*filename*][*.ext*] [*/S*]

Type: Internal External
***

Remarks: The *filename* can contain global file name characters, so it is possible to hide more than one file with a single command.

/S will mark the file as a system file, in addition to the marking it as hidden. System files are also hidden from normal directory searches. Currently, IBM DOS treats system files identically to hidden files. This may change in future versions of DOS.

Example: In this example, the file SECRET.INF is hidden.

HIDE SECRET.INF

SHOW
Command

Expanded DOS © Home Computing Journal 1987

Purpose: Removes the hidden flag from a hidden file so that it is listed in normal directory searches. SHOW can optionally remove a file's system flag.

Format: SHOW [*d:*][*path*][*filename*][*.ext*] [*/S*]

Type: Internal External
***

Remarks: The *filename* can contain global file name characters, so it is possible to show more than one file with a single command.

/S will remove the system file flag from a file, in addition to removing the hidden flag. System files are also hidden from normal directory searches. To properly show a system file, you must include the /S option. Currently, IBM DOS handles system files identically to hidden files. This may change in future versions of DOS.

Example: In this example, the hidden file SECRET.INF is un-hidden.

SHOW SECRET.INF

REVEAL
Command

Expanded DOS © Home Computing Journal 1987

Purpose: Lists all hidden files, or only specific hidden files. (Hidden files include hidden and system files.) The display line for each file includes its size, the date and time the file was last written to, and the type of file (hidden, system, or hidden system).

Format: REVEAL [*d:*][*path*][*filename*][*.ext*]

Type: Internal External
***

Remarks: The *filename* can contain global file name characters. There are two options when listing a disk's hidden files. You can list all hidden files, or just selected hidden files.

Option 1 - List All Files
Use this option to list all the hidden files in a directory. For example:

REVEAL [*d:*][*path*]

If the drive is specified, the listing is of all hidden files on the specified drive. If a path is specified, the listing is of hidden files in the specified directory.

Option 2 - List Selected Files
Use this option to list selected files in a directory. For example:

REVEAL [*path*]*filename.ext*

If either *filename* or *.ext* is omitted, the global file name character * is assumed. In this example, we want to list all hidden files in the directory that have the specified file name and extension.

If you enter:

REVEAL SECRET.INF

the screen might look like this:

```
SECRET   INF   6248  12-20-86    4:37p   Hidden File
```

If you enter:

REVEAL *.COM

the screen might look like this:

```
IBMBIO   COM    4736  10-20-83  12:00a   Hidden System File
IBMDOS   COM   17024  10-20-83  12:00a   Hidden System File
2 File(s)
```

GETSTR & PUTSTR

Create text windows, fast character graphics, instantaneous screen dumps, and more!

One of the TI-99/4A computer's strongest features is graphics. Both TI BASIC and TI Extended BASIC have several built in commands for manipulating screen graphics. Here, we present even two more; **GETSTR** and **PUTSTR**. These multi-functional commands can add life to an otherwise slow program.

GETSTR is what you might call **GCHAR**'s big brother. The difference between the two commands is that **GETSTR** can get up to 255 characters from the screen, while **GCHAR** can only get one. Now, reading multiple characters from the screen no longer requires the use of slow and cumbersome **FOR-NEXT** loops.

PUTSTR is related to the two commands **VCHAR** and **HCHAR**. The difference here is that **PUTSTR** can place up to 255 characters onto the screen, while **VCHAR** and **HCHAR** can only place one (or a repeated number of one) character. Do not confuse this command's capabilities with the **DISPLAY AT** command. With our's, you not only can specify the starting position of output characters, but you can also specify the left, right, top, and bottom borders in which the characters are displayed. Both of these new commands act on any retangular section of the screen. So, you are not limited to just one character or even one screen line.

How To Use Them

Use of these two new commands requires TI Extended BASIC and the 32K Memory Expansion. These commands are written in assembly language and linked to Extended BASIC through the **CALL LINK** command. The file GETPUT_O on your HCJ Volume 3 disk contains the machine language for these two commands. The following code loads this file into memory:

```
CALL INIT :: CALL LOAD("DSK1.GETPUT_O")
```

You should include this code at the beginning of any program that uses the **GETSTR** or **PUTSTR** command. The **CALL INIT** command only has to be executed once, so if you are going to load any addition assembly language files, such as ACCEPT_O (refer to this Volume's TI Technote), use the following commands:

```
CALL INIT :: CALL LOAD("DSK1.GETPUT_O")::
CALL LOAD("DSK1.ACCEPT_O")
```

Figure 1

GETSTR Syntax:

```
CALL LINK("GETSTR",TOPROW,TOPCOL,BOTROW,BOTCOL,S$)
```

PUTSTR Syntax:

```
CALL LINK("PUTSTR",TOPROW,TOPCOL,BOTROW,BOTCOL,S$)
```

The Syntax

Once GETPUT_O is loaded, you can start using the new commands. Figure 1 shows the syntax for each command.

Both of these commands require that you specify the area of the screen that you wish to get or put characters to. We call this "area of the screen" the window. A window's size and location is defined by its upper-left and lower-right corners. The parameters TOPROW and TOPCOL specify the uppper-left corner of the window. The parameters BOTROW and BOTCOL specify the bottom-right corner of the window. TOPROW and BOTROW must be between 1 and 24 while TOPCOL and BOTCOL must be between 1 and 32.

In a **GETSTR**, the S$ parameter receives characters from the window. If the window area contains more than 255 characters, only the first 255 characters are placed into S$.

In a **PUTSTR**, the contents of S$ are placed into the window. If the window is not large enough to hold the entire contents of S$, only the characters that fit are placed onto the screen. If the window area is larger than S$, the remaining section of the window is filled with blanks.

A Couple Of Examples

We have written two short demonstration programs that take advantage of the **GETSTR** and **PUTSTR** commands. These programs are *DEMO1* and *DEMO2*. Both programs are included on your HCJ Volume 3 disk.

DEMO1 shows how the **GETSTR** and **PUTSTR** commands can create movable, expandable, and updatable text windows on your screen. This program creates a text window that displays the program's instructions. By using the **E, S, D,** and **X** keys, you can move the windows upper-left corner. The **I, J, K,** and **M** keys move the lower-right corner of the window. The speed at which the text is re-flowed inside the window is quite remarkable. Let's see you do this one with **HCHAR**s. . .

Besides moving a text window around the screen, you can print the screen by pressing **[CTRL] P**. Normally, one must **GCHAR** the screen, slowly sending each character to the printer. With **GETSTR**, however, *DEMO1* is able to grab a whole screen line at a time, printing the screen in record time. This screen dump subroutine is located in lines 520-590. Press **[FCTN] 9** to exit the program.

Another great use for the **GETSTR** and **PUTSTR** commands is character graphics. There is no quicker method of placing character graphics on the screen than **PUTSTR**. The program *DEMO2* drives this point home. This program displays a screen of text describing the program's operation while a smiling face hyperactively jumps around the screen. You can speed up the frantic face by holding down the **[FCTN] E** key. Holding down **[FCTN] X** calms the smiling

face down a bit. To create the face, the **PUTSTR** command places 9 redefined characters on the screen in a three by three block (window).

Notice that characters covered by the smiling face are restored when the face moves (just like sprites!). **GETSTR** saves the area of the screen that the smiling face is about to invade and **PUTSTR** puts the characters back when the face leaves. This speed in character animation is invaluable when designing games and other graphic intensive programs.

Use of these two new commands are not limited to the examples provided here. How about a text editor with visual cut and paste, a character-graphics jigsaw puzzle, or even pull-down menus? No matter what the application may be, we think that you'll find these two commands very useful.

CONTROL CAPSULE

DEMO1

Key	Function
E	Move top corner of window up
X	Move top corner of window down
S	Move top corner of window left
D	Move top corner of window right
I	Move bottom corner of window up
M	Move bottom corner of window down
J	Move bottom corner of window left
K	Move bottom corner of window right
FCTN 9	Exit program

CONTROL CAPSULE

DEMO2

Key	Function
FCTN E	Speed up smiling face
FCTN X	Slow down smiling face
FCTN 9	Exit program

LINE ANNOTATIONS

DEMO1

Line Nos.	Explanation
100-180	Program header
190-200	Load machine-language file
210-300	Initialize program
310-430	Program's main loop
320	Print text window
330	Read keyboard
340	Move top corner left
350	Move top corner right
360	Move top corner up
370	Move top corner down
380	Move bottom corner up
390	Move bottom corner down
400	Move bottom corner left
410	Move bottom corner right
420	Initiate screen dump
430	Check for [FCTN] 9
440-510	Exit program
520-590	Print screen dump

LINE ANNOTATIONS

DEMO2

Line Nos.	Explanation
100-180	Program header
190-200	Load machine-language file
210-250	Initialize program
260-330	Print instructions
340-410	Program's main loop
350	Get random screen position
360	Get underlying characters and print face
370	Read keyboard and check for [FCTN] 9
380	Speed up or slow down faces's speed
390	Delay loop
400	Restore underlying characters
410	Go to beginning of loop
420-480	Exit program
490-510	Character graphics data

Apple II Family

Procedures For Loading Apple II Computers

1. Place the HCJ disk in drive 1.
2. Turn on the Apple computer. The HCJ Startup menu will appear, asking if you wish to use the HCJ Director program, go to Applesoft BASIC, or use the ProDOS Filer.
3. Select HCJ Director from the menu.
4. A list of the programs included on the HCJ disk will appear on the screen. Enter the number corresponding to the program that you wish to run and press [**RETURN**].
6. Make sure that the HCJ disk is still in drive number 1 and press [**RETURN**] again. The selected program will **LOAD** and **RUN** for you. You may press [**ESC**] before pressing [**RETURN**] for the second time, if you change your mind.

***

Due to the extensive size and number of this Volume's programs, we were unable to include the *Codeworks* programs on your HCJ Volume 3 disk—it just wouldn't fit! We plan to include *Codeworks* on all future HCJ disks.

***

Program Name	File Name	Language
ProDOS Utilities	PRODOS*	-system file-
	BASIC.SYSTEM*	-system file-
	FILER*	-system file-
	STARTUP	Applesoft BASIC
HCJ Director	HCJDIR	Applesoft BASIC
IS-Base	ISBASE	Applesoft BASIC
	CAPITALS	-data file-
	MADONNA	-data file-
Crossword Composer	CROSSWORD	6502 machine code
	ALL.PRT	-printer driver-
	EPSON.PRT	-printer driver-
	GUITAR.PUZ	-data file-
Perfect Puppy	PERFECT	Applesoft BASIC
	SMARTS.AI	-data file-
Apple Character Editor	CHAREDIT	Applesoft BASIC
	HIRESTEXT.BIN	6502 machine code
	STANDARD.FNT	-data file-
	FATFONT.FNT	-data file-
Fontpad	FONTPAD	Applesoft BASIC
INTRING	INSTRING	6502 machine code
INSTRING Demo	INSTRING.DEMO	Applesoft BASIC

*ProDOS, and ProDOS Utilities, Copyright © 1983-87 Apple Computer, Inc.
Note: The Apple II Family HCJ disk contains portions of the Apple ProDOS operating system that allow the disk to be used by itself.

About HCJ Director and CodeWorks

The directories and instructions on these two pages should help you locate any program file on your HCJ diskette and give you the necessary information to successfully run any program. Each system has its own specially designed HCJ Director program that allows menu-driven access to the programs in this Volume.

Each disk also contains a CodeWorks program that describes which sections of code accomplish specific tasks in our BASIC Feature programs. Full operating instructions are included in each CodeWorks program explaining how to either view the information on screen, or dump it to your system's printer.

Atari 800, 800XL, 130XE

Procedures For Loading Atari Computers

1. Place your DOS 2.5 systems disk in drive 1.
2. Turn on the Atari computer.
3. After READY appears in the upper-left corner of the computer screen, insert the HCJ disk into drive 1.
4. Type **RUN "D:HCJDIR"** and press [**RETURN**].
5. A list of the programs included on the HCJ disk will appear on the screen. Enter the number corresponding to the program that you wish to run and press [**RETURN**].
6. The selected program will **LOAD** and **RUN** for you.

Program Name	File Name	Language
HCJ Director	HCJDIR	Atari BASIC
Codeworks	CODEWORK	Atari BASIC
It Figures!	FIGURES	Atari BASIC
Savings Planner	SAVING	Atari BASIC
Matrix Muncher	MATRIX	Atari BASIC
INTRING$	INSTRING	Atari BASIC

Note: Because some programs reconfigure your computer's memory, it is recommended that you press the [**RESET**] key or re-boot your computer if you experience problems running a new program.

Commodore 64

Procedures For Loading The C-64

1. Turn on your computer system.
2. Place the HCJ disk into the drive known as device number 8.
3. Type **LOAD "HCJDIR",8** and press [**RETURN**]. After the loading procedure is complete and the cursor returns, type **RUN** and press [**RETURN**].
4. A list of the programs included on the HCJ disk will appear on the screen. Enter the number corresponding to the program that you wish to run and press [**RETURN**].
5. Make sure that the HCJ disk is still in drive number 8 and press [**RETURN**] again. The selected program will **LOAD** and **RUN** for you. You may press your computer's left-arrow key before pressing [**RETURN**] for the second time, if you change your mind.

Program Name	File Name	Language
HCJ Director	HCJDIR	C-64 BASIC
CodeWorks	CODEWORK	C-64 BASIC
IS-Base	IS-BASE.COM*	Compiled BASIC
	IS-BASE.BAS	C-64 BASIC
	CAPITALS	-data file-
	MADONNA	-data file-
Crossword Composer	CROSSWORD	6510 machine code
	CROSSWORD.EPSON	6510 machine code
	ALL.PRT	-printer driver-
	EPSON.PRT	-printer driver-
	GUITAR.PUZ	-data file-
Perfect Puppy	PERFECT	C-64 BASIC
	SMARTS.AI	-data file-
HCJ Duplicator	DUPLICATOR	6510 machine code
Title Maker	TITLE MAKER	C-64 BASIC
	TMAKER.S	Assembler source file
	TIME PIECE	C-64 BASIC
	FLAP ATTACK	C-64 BASIC

*Program compiled using the Abacus Software BASIC-64 compiler.
Note: Because some programs reconfigure your computer's memory, it is recommended that you restart your computer if you experience problems running a new program.

IBM PC, PCjr, and Tandy 1000

Procedures For Using The IBM PC, PCjr, Or Tandy 1000

To make use of the HCJ Director menu program on your HCJ disk you need to backup your disk. Use the following procedures to produce an autoboot backup of your HCJ disk:

If you have a dual-drive system you may start with step 1, otherwise read this paragraph first:

For those of you with a single disk drive, you may still use the commands as listed below, though you will need to pay very close attention to the prompts on the screen instructing you to swap disks from time to time. The computer will tell you to place the appropriate disk in drive B:. What it means, however, is to remove the disk from drive A: and insert the disk which would have gone in drive B:. Using a single drive may mean having to swap disks quite a few times. For those who are patient though, the rewards are worth the added work. If you have further questions consult your DOS manual on the FORMAT and COPY procedures for a single-drive system.

1. Place your DOS master disk (hereafter refered to as the DOS disk) in drive A: and turn on the power to your system.
2. Enter the command **FORMAT B: /S /V**
3. The computer will ask you to place a blank disk into drive B: to be formatted. Ensure that the blank disk is in the drive and then press [Enter]. After formatting, you will be asked for a volume name. Enter **HCJOURNALn** where **n** is the Volume number. Then, you will be asked if you want to format another. Respond No to this prompt which returns you back to DOS.
4. If you wish to use a color monitor enter the command **COPY A:MODE.COM B:**
5. Enter the command **COPY A:BASIC*.* B:BASIC.***

If you have an IBM compatible whose BASIC does not start with the word BASIC, then make adjustments in the command above for your version. In any case, the file on your new boot disk should always be named BASIC even if it was originally named BASICA.

6. After BASIC is copied to the new disk in drive B:, remove the DOS disk from drive A: and place the HCJ disk in drive A:
8. Enter the command **COPY A:*.* B:**
9. After the last file has been copied, remove both disks from the system. Label the new disk as **HCJ ON DISK BACKUP Volume n**, where **n** is the Volume number, and place the original disk in a safe place.
10. The new disk you have created can now be used to boot your system (start from a power off condition) and will automatically bring up a menu of programs from which you may select.

You may also use the HCJ disk without backing it up if you:

1. Start from DOS 2.1 or later.
2. If you wish to run a program with a BAT, COM, or EXE extension, simply type the file name from the DOS A> prompt.
3. If you wish to run a BASIC program, you must first enter the appropriate version of BASIC, then **LOAD** and **RUN** the program.

Note: If you have an IBM PC and the program requires a color monitor, you must enable the monitor using the appropriate DOS **MODE** command before running the program.

Program Name	File Name	Language
HCJ Director	HCJDIR.COM*	Turbo Pascal
	AUTOEXEC.BAT	-batch file-
CodeWorks	CODEWORK.COM*	Turbo Pascal
IS-Base	IS-BASE.COM*	Turbo Pascal
	CAPITALS	-data file-
	MADONNA	-data file-
Crossword Composer	CROSS.COM*	Turbo Pascal
	IBM.DRV	-printer driver-
	EPSON.DRV	-printer driver-
	GUITAR.PUZ	-data file-
Perfect Puppy	PERFECT.BAS**	BASICA
	SMARTS.AI	-data file-
Expanded DOS	CFD.COM*	Turbo Pascal
	HIDE.COM*	Turbo Pascal
	SHOW.COM*	Turbo Pascal
	REVEAL.COM*	Turbo Pascal
FormFlex	FORMFLEX.COM***	Turbo Pascal
	MAKEFORM.CHN***	Turbo Pascal
	USEFORM.CHN***	Turbo Pascal

*Program requires: DOS 2.1 or later.
**Program requires: DOS 2.1 & either Cartridge BASIC on PCjr or BASICA on PC, or GW BASIC on Tandy 1000.
***The original version of *FormFlex* provided on the HCJ Volume 2 disk does not run on some PCjr systems (insufficient memory often being the result). The version of *FormFlex* provided here has been has been modified to run on any 128K PCjr.

TI-99/4A

Procedures For Loading The TI-99/4A With Extended BASIC

1. Ensure the Peripheral Box is properly connected to the console. Turn on the Peripheral Box.
2. Place the Extended Basic module securely in the machine.
3. Turn on the TI-99/4A computer.
4. Insert the HCJ disk into drive 1.
5. Strike any key to bring up the first menu, then select Extended BASIC, and The HCJ Director program will automatically **RUN**.
6. Select the number of the program you wish to run, then press [ENTER] and the program will load and **RUN** automatically.

Procedures For Loading The TI-99/4A With TI BASIC

1. Ensure the Peripheral Box is properly connected to the console. Turn on the Peripheral Box.
2. Turn on your computer and insert the HCJ disk in drive 1.
3. Strike any key to bring up the first menu, then select BASIC.
4. To load the BASIC program you wish to use, type **OLD DSK1.file name** where **file name** is the file name of the program. For example, if you wish to use *Perfect Puppy* type **OLD DSK1.PERFECT** and press [ENTER]. Now, type **RUN** and press [ENTER].

***

Due to the extensive size and number of this Volume's programs, we were unable to include the *Codeworks* programs on your HCJ Volume 3 disk—it just wouldn't fit! We plan to include *Codeworks* on all future HCJ disks.

***

Program Name	File Name	Language
HCJ Director	LOAD	Extended BASIC
IS-Base	IS-BASE	Extended BASIC
	CAPITALS	-data file-
	MADONNA	-data file-
Crossword Composer	CROSSWORD*	Extended BASIC
	CROSS_O	TMS 9900 object file
	ACCEPT_O	TMS 9900 object file
	EPSON_DRV	-printer driver-
	GUITAR_X	-data file-
Perfect Puppy	PERFECT	BASIC
	PERFECTX	Extended BASIC
	SMARTS_AI	-data file-
GETSTR & PUTSTR	GETPUT_O*	TMS 9900 object file
	DEMO1*	Extended BASIC
	DEMO2*	Extended BASIC
ACCEPT (improved)	ACCEPT_O*	TMS 9900 object file

*Requires 32K Memory expansion.

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